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Fracture of the external angular process of the frontal bone: its relation to maxillofacial fractures

■ *Irwin A. Small, D.D.S.; Donald R. Simmons, M.D., and H. Harvey Gass, M.D., Detroit*

Skull fractures frequently complicate the surgical procedure in the reconstruction of a maxillofacial fracture. A common problem created by such a combination of injuries is the required waiting period during which definitive neurosurgery is carried out or the observation time is completed for possible intracranial complications that may endanger the patient's life. At times close cooperation between the neurosurgeon and the maxillofacial surgeon will result in a combined procedure that is helpful to the solution of both problems. A fracture of the external angular process of the frontal bone provides such a circumstance. The following discussion represents our experience with this uncommon fracture of the frontal bone, and illustrates the advisability of the combined efforts of two surgical disciplines in the repair of craniofacial fractures.

The external angular process of the frontal bone is one of the strongest components of the craniofacial skeleton (Fig. 1). The process itself is a buttress to both the skull and face. It forms the superior and superior-lateral boundary of the orbital rim and the external angle of the frontal bone, and it articulates with the frontal process of zygoma inferiorly. A search of the literature has failed to reveal any discussion of a solitary fracture of the external angular process of the frontal bone. Apparently it is not commonly fractured as an isolated anatomic entity.

■ *Neurosurgical Considerations*

The treatment of craniofacial injuries involves two considerations. First, the necessity of surgical intervention to correct depressed skull fractures and evacuation of any evident intracranial hematomas immediately after the stabilization of the patient's general condition, and second, the necessity for observation after the head injury in order to detect the development of an intracranial hematoma if immediate surgery is not necessary. Such hematomas may occur within a few hours

From the departments of oral surgery and neurosurgery, Mount Carmel Mercy Hospital.

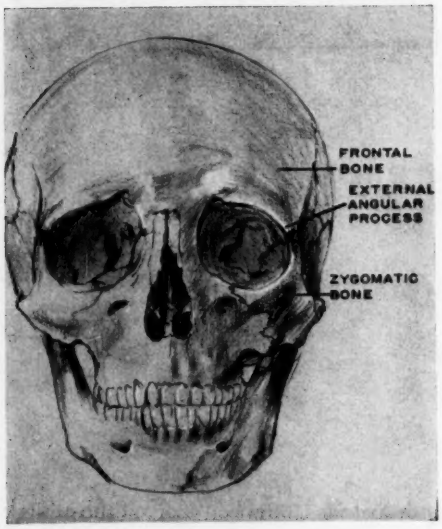

Fig. 1—External angular process

after an intracranial injury or at any time thereafter. Those that occur within 36 to 48 hours after the injury may do so with great rapidity, and the need for neurosurgical evacuation may be desperate. After such a period, however, the hematoma is apt to develop more slowly, and signs indicating it may appear more gradually so that it is not so urgent.

If the first consideration which demands immediate neurosurgical treatment is in effect and there is a concomitant maxillofacial injury which requires surgery, a combined procedure usually may be performed. If the patient's general condition permits, the surgical correction of the maxillofacial injury may be done at the completion of the neurosurgical elevation and débridement. If immediate neurosurgical treatment is not needed, it would be wise to postpone any maxillofacial surgery until 36 to 48 hours have passed. Thereafter, if the patient has recovered consciousness completely and is alert with no evidence of neurological sequelae, surgery may be done at any time. General anesthesia may be given now if needed. If the patient's level of consciousness has not completely returned to normal, it would not be wise to depress this level further by the superimposition of a general anesthetic. Corrective surgery, if not extensive, however, could be performed for a patient whose level of responsiveness is not complete if his condition has stabilized for a period of time and if the procedure could be accomplished under local anesthesia.

The presence of a depressed skull fracture contraindicates application of plaster head caps, as do unhealed extensive scalp lacerations. The existence of linear skull fractures, however, in a fully recovered patient would not contraindicate the use of such apparatus.

In this report attention is being drawn to the isolated fracture of the external angular process of the frontal bone. The force producing an isolated fracture of this bone must arrive from either a lateral or frontal direction. A force sufficient to fracture this sturdy part certainly will displace it also. The displacement, therefore, is usually medial or posterior with varying degrees of angulation in the superior or inferior direction.

In the two instances reported herein, the displacement was primarily in a posterior direction. The fractured fragment in each instance was found to be lodged in the anterior fossa of the skull and driven into cerebral tissue. The dura and frontal lobes had been penetrated by the fragment and direct communication between

cerebral tissue and the outside was apparent through the lacerated region. Spinal fluid was seen to escape through this avenue. In the repair of such injuries, a wide débridement of contused and macerated cerebral tissue is essential after withdrawal of the displaced fragment.

After removal of all devitalized tissue and careful hemostasis, attention must be directed toward prevention of cerebrospinal fluid fistula. Such an occurrence would invite the development of a meningitis with its potential dangers. Although the dura may be torn extensively, a tight dural closure more than likely is feasible since the débridement of frontal lobe tissue has made additional space available so that torn dural edges may be brought together without undue pressure on cerebral tissue. If this is not possible, then it may be necessary to consider the use of some dural substitute layer, whether autogenous or artificial.

There may be concomitant fractures of the roof of the orbit. Loose comminuted fragments representing the roof of the orbit may be discarded. Fragments representing the supraorbital arch along with the external angular process of the frontal bone, however, should be preserved. Because of the location of these parts in a relatively hair-free area, contamination by in-driven hair is not apt to be a problem as in compound depressed skull fractures elsewhere in the head. These parts may be cleaned thoroughly and washed unless unduly contaminated by dirt which defies cleaning, and their replacement and fixation (with wire, if necessary) should be possible.

The external angular process fracture probably will include the lateral superior rim of the orbit and its accurate restoration is important. If the supraorbital arch is intact, wires may be placed between it and the external angular process, and also between the frontal bone superiorly and the external angular process to fix the displaced fragments securely. It may be possible to utilize the fragment as an anchoring point for repair of any associated zygomatic fracture. The actual location of the fixation wires between the external angular process and the supraorbital arch of the frontal bone would depend on the exact nature and location of the fracture lines. It should be possible, however, in most instances to accomplish a true cosmetic reconstruction. Particular attention should be directed toward the recovery and careful handling of this part with a view towards its replacement after the intracranial débridement has been completed.

Although the two instances described here do not represent a displacement of this part into the orbit, a force directed from the lateral direction probably would produce such a displacement. In that case, the process probably would lodge within the orbit itself and there might be damage to the orbital contents. In any event, the process could be elevated and, as with posteriorly displaced fragments, it might be fixed to the frontal bone or the zygoma by wires or wedging between bone fragments alone.

■ *Maxillofacial Considerations*

Many technics and modifications thereof have been devised for treatment of maxillofacial fractures. In the reduction of a maxillofacial fracture, the simplest procedure usually is best. Many papers in

recent years, however, have pointed out the problems in connection with the use of closed reduction technics alone. Reduction of fractures that appeared to have been satisfactory at the operating table, have proved to be less than adequate in later follow-up examinations when edema has subsided. Open reduction should be used if difficulty can be anticipated in reducing and fixing any fracture by the closed technic alone. This is especially true in zygomatic fractures in which the closed technics are often used alone.

Zygomatic fractures can be divided into four anatomic types; fractures of the infraorbital rim, fractures of the zygomatic arch, fractures of the body of the zygoma, and fractures of the frontal process of zygoma. Of course, many of these occur in combination, and frequently the zygoma is disarticulated with separation at the zygomaticofrontal, zygomaticomaxillary and zygomaticotemporal suture lines. Fractures of the infraorbital rim and the zygomatic arch frequently can be reduced by simple elevation. Fractures of the frontal process or multiple fractures of the malar bone, however, properly require open reduction and cranial fixation.

Fractures of the maxilla also may require cranial fixation when associated with zygomatic fractures. A fracture disarticulation of the maxilla can be suspended easily from an intact zygomatic arch, but when the arch is also fractured, the external angular process of frontal bone may be the only means of adequate fixation short of the plaster head cap. The contraindications to the use of the plaster head cap have already been mentioned. The head cap is useful for fixation at times, but cranial fixation is much more stable, less uncomfortable and will not produce the dimpled scar in the cheeks caused by the suspending wires.

The external angular process of the frontal bone is the key to the proper reduction and fixation of a severely depressed zygomatic fracture. Such a fracture may be corrected by open reduction at the zygomaticofrontal suture line with its inconspicuous superciliary incision, coupled, if necessary with elevation of the arch and infraorbital rim. Suspension by stainless steel sutures to the external angular process of the frontal bone will help maintain the reduction (Fig. 2).

If the external angular process of the frontal bone is not available, adequate reduction of many zygomatic and maxillary fractures would not be possible (Fig. 3). Its preservation and restoration, therefore, is important even if the maxillofacial surgery must be done at a secondary operation. In the two instances reported here, it was possible to accomplish this even though the parts were driven into cerebral tissue and despite the compound nature of the fracture.

■ *Report of Cases*

CASE 1—A 42 year old man was involved in an auto accident September 1, 1955. He was transferred to Mount Carmel Mercy Hospital with diagnosis of depressed skull fracture, compound fracture of left femur and shock. His past medical history was essentially negative. A wound above his right eye had been cleaned, and a laceration of the left leg had been débrided and sutured at another hospital. He had also received 1,500 units of tetanus antitoxin, 2 cc. of penicillin plus streptomycin, 1,000 cc. of whole

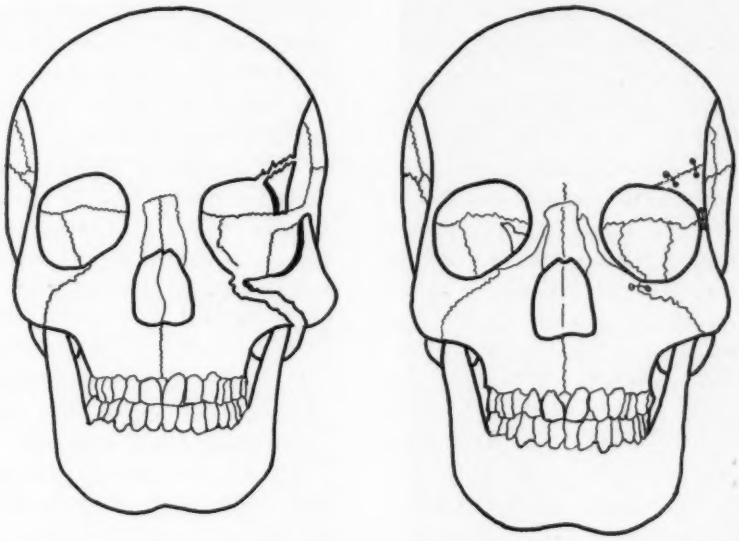

Fig. 2—Left: Fracture of external angular process and zygoma. Right: Open reduction and wire fixation of fractured external angular process and zygoma

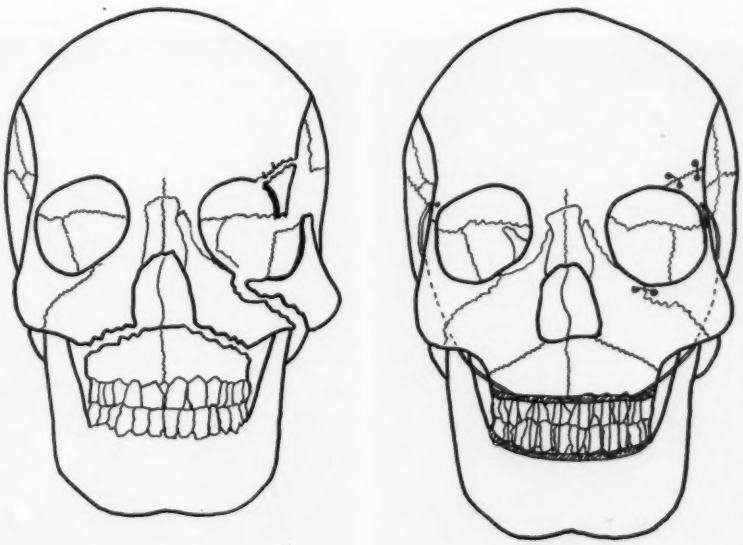

Fig. 3—Left: Fracture of external angular process, zygoma and maxilla. Right: Open reduction and cranial suspension of fractured maxilla with associated fracture of external angular process and zygoma

blood and 500 cc. of 5 per cent glucose in water intravenously.

PHYSICAL EXAMINATION—The patient was a well developed, well nourished, white man, conscious and cooperative, but pale. His blood pressure was 96/50, his pulse 90, and his respirations 24. There was a pressure dressing over the wound above the right eye. The laceration of the left leg was closed with silk sutures, and the limb was in a splint with traction. Neurological examination revealed a conscious patient with no motor or sensory loss in the extremities. The cranial nerves were intact. There was hemorrhage into the anterior chamber of the right eye. The pupils were round, equal and reacted to light and accommodation. The remainder of the physical examination was negative.

Laboratory studies revealed a normal red blood cell count and hemoglobin determination and a white blood cell count of 15,800 per cubic millimeter. Urinalysis was normal, except for traces of albumin and acetone without sugar.

A compound depressed fracture of the right frontal bone, a fractured right zygoma, and a compound comminuted fracture of the left femur were evident on roentgenograms obtained at the other hospital (Fig. 4).

COURSE IN HOSPITAL—Shortly after admission the patient was operated on under endotracheal anesthesia. The edges of the laceration above the right eyebrow were separated and the depressed bone fragments and leaking cerebrospinal fluid exposed. A few attached tissue strands were severed and two or three loose fragments of bone were removed exposing brain

Fig. 4—Left: Fracture of external angular process and zygoma. Right: Lateral view of preoperative fractured external angular process and zygoma. Note posterior displacement

tissue in the wound. Several fragments making up the roof of the orbit and lateral and superior lateral rim of the orbit were found, removed and saved. A depressed fragment representing the medial superior rim of the orbit was elevated back into place. The dural edges were retracted as encountered, exposing lacerated brain representing the frontal pole.

The lacerated brain tissue was removed with an aspirator until fairly normal tissue was reached and this included the entire right frontal pole of the brain. Hemostasis was obtained by coagulation and absorbable gelatin sponge packs; the dura was then closed with interrupted silk sutures. A fairly good dural closure was obtained. The dural sutures were covered over with absorbable gelatin sponge. The fragment representing the superior and lateral rim of the orbit (external angular process) was replaced.

The zygomatic bone was carefully elevated so that the zygomaticofrontal suture line was reconstructed (Fig. 5). The three cornered segment of frontal bone was wired into its normal position with three 28 gauge stainless steel wire ligatures, one through the superior medial rim of the orbit, one through the frontal bone and one across the zygomaticofrontal suture line. The two or three gaps in the frontal bone proper were filled with loose, clean bone fragments, and the pericranium was sutured over this to hold it in place. The wound was irrigated with one million units of penicillin and 20,000 units of bacitracin. The scalp was closed in layers. Copious saline irrigation was used throughout the operation and loose bone fragments thoroughly cleansed before replacement.

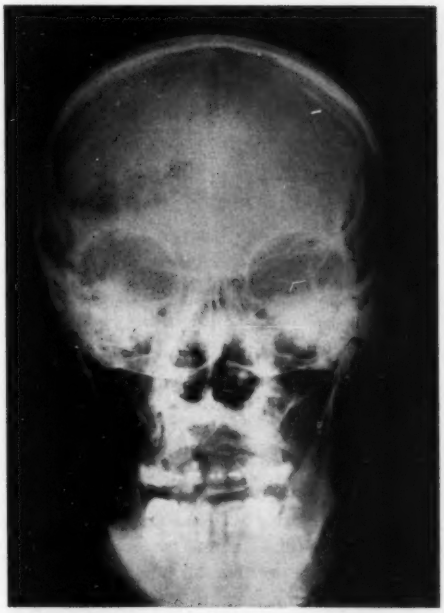

Fig. 5—Postsurgical reduction of fractured external angular process and zygoma

The postoperative course was uneventful and the patient recovered with no residual neurologic deficiency or cosmetic deformity.

CASE 2—The patient, a 27 year old negro woman, was involved in an auto accident on September 23, 1955, and admitted to Mount Carmel Mercy Hospital. She was unidentified and unable to give a past medical history.

PHYSICAL EXAMINATION—The patient was a well developed, well nourished, negro woman with facial and frontal lacerations with penetration into cerebral tissue. Blood pressure was 114/60, pulse 60, and respirations 24. She was comatose. Her eyes were divergent and the pupils

fixed. There was a massive hematoma involving the left side of the face, and there was bleeding from the left ear, nose and mouth. Crepitation was palpable over the right clavicle. There were abrasions and contusions of knees and legs. No lateralizing or focal evidence of neurological deficit was found.

Laboratory studies revealed a normal red blood cell count and hemoglobin determination with a white blood cell count of 22,650 per cubic millimeter. Urinalysis was normal except for 1+ albumin and 3+ sugar.

The report of the roentgenographic examination was as follows:

> Posteroanterior occipital and lateral views of the skull reveal a fracture involving the lateral portion of the left frontal bone just superior to the orbit. This fracture is approximately 2 cm. in length. There is about 5 mm. depression of the fragment. There is a curvilinear posterior extension of the fracture which extends posteriorly for 5 cm. There is a fracture of the infraorbital ridge on the left with depression of fragments. The left antrum is somewhat clouded, secondary to hemorrhage. There is a fracture of the left zygomatic arch. There is a comminuted fracture of the nasal bones with depression of distal fragments. Anteroposterior view of the thorax reveals a fracture of the midportion of the right clavicle. The distal major fragment is displaced downward the width of the bone. There is also a fracture of the right 1st rib anteriorly.

COURSE IN HOSPITAL—Shortly after admission, the patient was operated on under endotracheal anesthesia. The laceration was opened and the scalp and subcutaneous tissues were stripped from the bony surfaces and retracted. The multiple small fragments of bone which were depressed were removed leaving a defect in the skull just lateral to and above the orbital rim. The defect was about 1.5 inches in diameter. A dural laceration, about 1 to 1.5 inches long, was found just underlying the depressed skull fracture. The brain underneath the lacerated dura was found to be badly macerated and contused, and the macerated portion of the brain tissue was removed. All bleeding points within the brain were stopped. The dura was then sutured.

The superior and lateral rim of the orbit (external angular process) which was depressed and mobile was sutured to the frontal bone with 28 gauge stainless steel wire. The frontal process of the zygoma was then elevated and sutured with wire to the external angular process of the frontal bone which had been previously fixed to the skull. Two large fragments from the depressed skull were replaced in the skull defect to cover the defect further. These were also wired in place with 28 gauge stainless steel wire ligatures. The laceration was then sutured in layers using no. 000 plain gut subcutaneously and no. 000000 Dermalon with multiple small interrupted sutures for the skin.

The postoperative roentgenograms revealed residual depression of the left infraorbital rim and zygoma; therefore, the patient was brought to surgery again six days after the first procedure. At this time with thiamylal sodium and succinylcholine chloride induction, endotracheal general anesthesia was instituted. A 2 cm. linear incision was made along the lower border of the left eyelid and parallel to the infraorbital rim. By means of sharp and blunt dissection, the incision was carried through the superficial fascia and orbicularis oculi muscle down to the infraorbital

rim. The periosteum was incised and reflected exposing the comminuted infraorbital rim which was depressed about .5 cm.

The open reduction which had been done during the craniotomy held the supraorbital rim and lateral rim of the orbit in fairly good position. Two bur holes were drilled in each of the largest fragments comprising the infraorbital rim. A 28 gauge stainless steel wire ligature was then passed through these holes and by means of traction and manipulation, the depressed infraorbital rim was elevated into good position. The wire was then twisted to fix the comminuted segments.

At this time it was felt that there was still some palpable depression of the zygomatic arch, and that open reduction at the zygomaticotemporal suture line might improve the contour of the face. A 1 cm. incision was made anterior to the tragus of the ear to explore the zygomatic arch. Exploration of the arch with a periosteal elevator and manual palpation failed to reveal significant depression of the arch. Both incisions were then closed with no. 0000 plain gut sutures subcutaneously and no. 00000 interrupted Ethacon sutures for the skin.

Postoperative roentgenograms revealed satisfactory reduction of all fractures, and healing took place without deformity.

Clinical evaluation of antihistamines in oral surgery using the double unknown technic

■ *G. R. Keesling,* D.D.S., and E. C. Hinds,† D.D.S., M.D., Houston, Texas*

Many favorable reports have been published on the effectiveness of antihistamines in oral surgery beginning with Silverman's[1] in 1953, showing a reduction in postoperative edema, pain and an increase in wound healing after tooth extraction. Using laboratory animals, Baldridge[2] verified that injected antihistaminic drugs in therapeutic doses would hasten soft tissue healing after traumatic surgery.

*Resident in oral surgery, Jefferson Davis Hospital.

†Bertner professor of surgery, University of Texas Dental Branch.

1. Silverman, R. E. Use of antihistamines in oral surgery: a preliminary report. J. Oral Surg. 11:231 July 1953.

2. Baldridge, O. L., Jr. Effects of the antihistamine pyrrobutamine on soft tissue wound healing. J. Oral Surg. 13:183 July 1955.

Sanders[3] in his experiments established a mean value for the histamine content of normal human gingiva and normal human saliva. He then demonstrated that the use of pyrrobutamine compound (Co-Pyronil) significantly lowered these values.

In this study of antihistamines, the double unknown technic was used, in which neither the subject nor the observer knows what or when test agents are employed. Placebos, which were capsules of starch, were inserted as unknowns. A standard of reference was employed (such as codeine in studies of analgesic agents). The order of administration of the test drugs, standard of reference and placebo were randomized. Using the double unknown technic, the subjective responses can be evaluated somewhat as would objective changes. The elimination of bias on the part of the subject or the observer is obtained using this technic.

The following antihistamines were used: pyrrobutamine compound (Co-Pyronil), promethazine hydrochloride (Phenergan) and a placebo. These were given to 116 oral surgery patients with third molar impactions.

All drugs were placed in capsules of the same color and size, and were given every six hours both preoperatively and postoperatively. Promethazine hydrochloride was given in amounts of 6.25 mg. per capsule. Pyrrobutamine compound contained drugs in the following amounts: pyrrobutamine, 12 mg.; methapyrilene hydrochloride, 25 mg., and cyclopentamine hydrochloride, 12.5 mg. per capsule. The drugs were given orally 24 hours preoperatively and continued for at least 36 hours postoperatively.

The patients were observed for evidence of edema, pain and healing. Side effects of the drugs were also evaluated. The code for the drugs was changed periodically so as to make the study more valid. All impacted third molars were removed by an oral surgery resident at either the Jefferson Davis Hospital or at the University of Texas Dental Branch.

The results show not only that antihistamines were not effective in reducing postoperative pain and edema and in improving healing, but that the placebo seemed to be more effective. No drug showed any significant side effect such as nausea or vomiting. The results of 116 cases of surgically removed third molars are shown in the table.

■ *Discussion*

As pointed out by Silverman, in the evaluation of such an important theory as that concerning the value of antihistamines in wound healing, it is essential that repeated analysis of the several aspects of the problem be made to confirm or disprove the original idea. If this contention is true then it should be no problem to repeat the investigations with similar results. This has not proved to be true in view of the results of Szmyd[4] and the present authors. A review of the problem reveals that the mechanism of inflammation is not thoroughly understood and certainly not universally agreed on.

Rocha e Silva,[5] in discussing the mechanism of inflammation stated: "To

3. Sanders, S. G. Chemical determination of histamine content of oral tissues and saliva. J. Oral Surg. 13:193 July 1955.

4. Szmyd, Lucian. Clinical evaluation of an antihistaminic preparation in oral surgery. Oral Surg., Oral Med. & Oral Path. 9:928 Sept. 1956.

5. Jasmin, G., and Robert, A. Mechanism of inflammation; an international symposium. Montreal, Canada, ACTA, Inc., 1953, p. 246.

Table

Results of use of antihistamines in 116 cases of surgically removed impacted third molars

Drug	Placebo			Promethazine hydrochloride			Pyrrobutamine compound		
Patients	39			41			36		
	Condition of patients in regard to edema, pain and healing								
	Exc.	Good	Poor	Exc.	Good	Poor	Exc.	Good	Poor
	First postoperative day								
Edema	28	11	0	22	14	5	16	11	9
Pain	30	8	1	22	15	4	20	10	6
Healing	30	8	1	26	14	1	19	14	3
	Fifth postoperative day								
Edema	27	12	0	24	15	2	24	10	3
Pain	28	5	6	22	13	6	17	15	4
Healing	32	3	4	24	13	4	24	10	2
	Tenth postoperative day								
Edema	35	3	1	32	5	1	24	9	3
Pain	33	4	2	28	7	5	21	10	5
Healing	33	3	3	31	9	5	22	10	4
	Incidence of complications								
Trismus	2			4			3		
Dry socket	3			5			5		
Nausea from drug	0			1			2		
Sleepiness from drug	1			5			4		

say that histamine is the whole question is as wrong as to say that histamine is out of the question."

As a part of the same discussion with reference to histamine, Menkin[6] stated as follows: "I have never denied that it may play a role, I have just emphasized that histamine is not the primary substance concerned in the mechanism of increased capillary permeability."

The problem of evaluating antihistamines used in wound healing to date has been approached several different ways. Silverman's investigations have been, self-admittedly, largely empirical. The first investigation on clinical surgery conducted by Kessler[7] involved, in part, use of the unknown technic to obtain a more objective result. Baldridge has approached this matter with the use of laboratory animals.

Clinical studies can be deceptive. Silverman mentioned the importance of the emotional factor: "The personality of the investigator as well as that of the patient can so influence conclusions that are drawn as to make them grow irrelative." Austin Smith[8] in an editorial stated, "The patient's faith in his physician adds great psychic power to the efficacy of any therapeutic measure and makes the placebo an important adjunct to treatment."

6. Jasmin, G., and Robert, A. Mechanism of inflammation; an international symposium. Montreal, Canada, ACTA, Inc., 1953, p. 269.

7. Kessler, M. M., and Van Emburgh, G. H. Use of antihistamines in treatment of surgical and accidental trauma. Indust. Med. 20:567 Dec. 1951.

8. Smith, Austin. Placebos. J.A.M.A. 159:780 Oct. 22, 1955.

There are possibilities of error in animal studies. For instance, could the findings of Baldridge be influenced by the response of the adrenal gland to the surgery? The same animals were used to test wound healing under varying circumstances, and it may be that the results were due as much to the level of cortisone as to the use or nonuse of an antihistamine drug.

Sanders' studies utilized a new and valuable method of measuring histamine levels. The histamine level in the saliva, however, may not be related necessarily to the quality of wound healing. The present theory is that antihistamines act not by reducing the amount of histamine but by competing for the receptive cells. One oral surgeon has recently stated that in a series of cases he noted that antihistamines were effective only in those patients who gave a history of allergy difficulties.[9]

With these possibilities in mind, then it may be justifiable to seek further proof that antihistamines are effective in all instances in reducing pain, swelling and other discomforts of wound healing. The double unknown technic, as previously stated, is an attempt to overcome some of the difficulties of accurate analysis by clinical investigation. It seems noteworthy that both reports utilizing the double unknown technic could demonstrate no improvement with the use of antihistamines.

Silverman[10] has raised a question of the relative values of the various antihistamines, and has expressed a preference for certain preparations. According to Goodman and Gilman,[11] little distinction can be made between antihistamine drugs on the basis of efficacy as histamine antagonists, and they further state that no antihistaminic drug is outstanding with respect to potency, dosage and relative incidence of side actions.

A question arises about the possible sequelae of interfering with reaction to trauma. Anti-inflammatory agents act by reducing or eliminating the vascular and other phenomena which are recognized as a part of the response to irritation. Whether or not interference with this reaction might in some way be detrimental is probably in this instance only of academic interest.

■ *Conclusions*

1. From recent studies involving the use of antihistamines for improving wound healing, an idea has arisen that antihistamines are of value.

2. As stated by previous authors, it is essential that the true value of these drugs and their mechanism be explored further.

3. The double unknown technic utilizing the unknown factor may be of value in clinical evaluation.

4. The study just concluded failed to confirm the previously stated value of antihistamines in wound healing.

9. Bell, Welden. Personal communication, 1956.

10. Silverman, R. E. Further clinical observations on the use of antihistamines in oral surgery. J. Oral Surg. 12:310 Oct. 1954.

11. Goodman, L. S., and Gilman, Alfred. Pharmacological basis of therapeutics, ed. 2. New York, The Macmillan Co., 1955, p. 661.

The use of acrylic splints after surgery for oroantral fistulas and palatal tori

■ *Newton E. Allen, D.D.S., U. S. Air Force*

Acrylic splints have been utilized in the retention and immobilization of soft tissue flaps and grafts in oral surgical procedures for several decades. Most of the appliances previously described in the literature depend on natural teeth for retention. Areas of usefulness for such devices include operations for the closure of oroantral fistulas and for the removal of palatal tori.

Without the help of suitable splints, oroantral fistulas may persist after careful surgical procedures. After the removal of a torus palatinus, there is a tendency for the sutured mucoperiosteal flaps to be displaced from their intended osseous beds, and the resulting space fills in first with a blood clot and then with granulation tissue. This eventually produces a thick fibrous pad which may be almost as objectionable as the original torus.

Burch[1] described the use of a splint lined with gauze to aid in the postoperative healing of an oroantral fistula. This splint was held in place by the use of two metal clasps placed around teeth near the field of operation.

Gross[2] recommended the use of an acrylic splint shaped as a horseshoe with wire embedded in the acrylic resin and extending across the arch for the purpose of supporting gauze against the palate after surgery. It has been used successfully in cleft palate surgery and in maintenance of pressure of the mucoperiosteal flaps against the palatal vault after the removal of tori. The appliance is kept in place by pressure against natural teeth, but metal clasps may be used if they are necessary.

The observation of oroantral fistulas and palatal tori in patients without teeth emphasized the need for a method of applying stents to edentulous arches or those missing almost all the teeth. A realization of this need prompted the development of the following technics.

■ *Method*

After successful surgical closure of an oroantral fistula, a splint made of self-curing acrylic resin is suitably adapted for suturing into place over the field of operation. The construction is simple and consumes little time.

An impression is made of the area after first protecting the fistula and adjacent tissue with tin foil to prevent the impression material from entering the antrum. A plaster model is poured into the impression. After the plaster is hard and the model has been removed from the impression, two layers of pink baseplate wax are warmed and molded over the model. The wax form is quickly trimmed

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1. Burch, R. J. Repair of antro-oral fistula: report of a case. J. Oral Surg. 7:72 Jan. 1949.

2. Gross, P. P. Surgery of the torus palatinus. D. Digest 52:16 Jan. 1946.

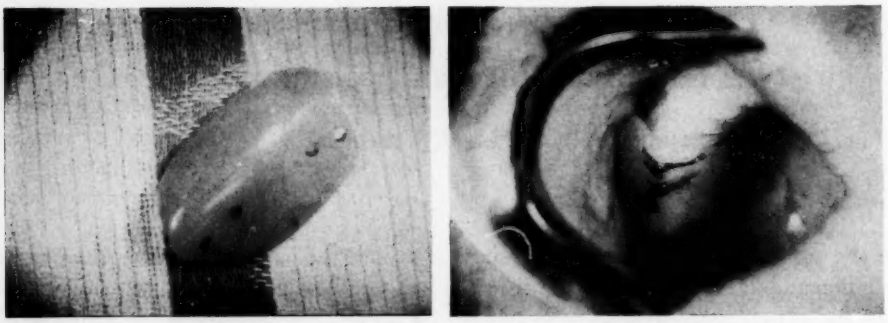

Fig. 1—Left: Splint to aid in closure of oroantral fistula is made of self-curing acrylic resin. Right: Splint over field of operation, sutured to unelevated underlying tissue

to the desired shape. The exposed part of the model is lubricated with oil, and a second mix of plaster is poured over the mold to form a counter-die.

As soon as the counter-die is hard, the two plaster parts are separated and the wax removed. The inside of the die is painted with a suitable coating and allowed to dry. A freshly mixed self-curing acrylic material is placed in the die and covered with wet cellophane. The model is pressed to the proper place, and the two parts are held together with elastic bands until the acrylic resin is cured. The splint is then removed, trimmed and polished. Four fairly large holes are drilled through the splint on the buccal side and four on the palatal side of the appliance for the reception of sutures (Fig. 1, left).

The surgical technic selected by the operator is employed to close the fistula. The splint is sutured into place by passing the sutures through the holes just described and attaching them into the underlying mucoperiosteum (Fig. 1, right). Care must be exercised to place the sutures in firm tissue and not in the flap that is used to close the antrum.

The splint is allowed to remain in place for 10 to 14 days. Postoperative results eight days after the removal of such an appliance that had remained in place 14 days (Fig. 2, left) is shown.

In the absence of time or facilities for the construction of an acrylic splint, a gauze pad may be substituted for the acrylic splint and sutured over the field of operation (Fig. 2, right).

Unless the space that is usually present between the mucoperiosteum and the underlying bone after the removal of a palatal torus is eliminated by positive pressure, blood collects beneath the flaps, and a thick fibrous pad may form in the space. This positive pressure may be supplied by firmly suturing a gauze pad over the area. After the flaps are sutured in the usual manner, several layers of ½ inch iodoform gauze strip are carefully folded to form a pad slightly longer than the suture line. It is held in place by the assistant's using a blunt instrument, such as the handle of a mouth mirror, while the needle carrying no. 000 silk is passed through the palatal mucoperiosteum on one side of the gauze and then through

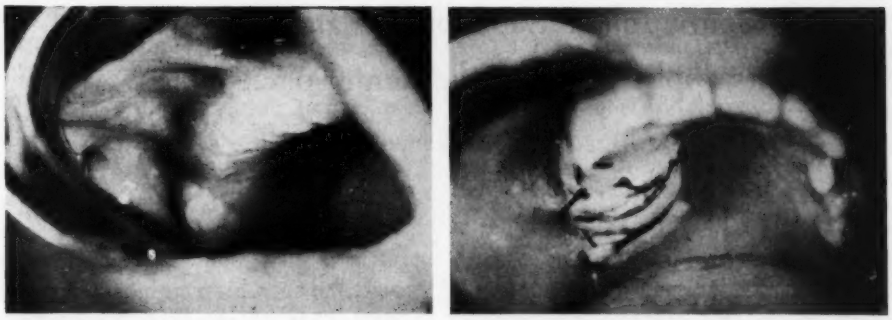

Fig. 2—Left: Field of operation eight days after removal of splint that had remained in place 14 days after closure of oroantral fistula with palatal flap. Right: Gauze pad used as splint and sutured over field of operation after closure of oroantral fistula

a similar portion of tissue on the opposite side. The silk is then tied across the pad to retain it in position. As many sutures as are needed to secure the dressing are placed. When large tori are removed, one to four 2 by 2 exodontia sponges are folded into the desired shape and sutured into position over the previously placed iodoform gauze.

The gauze is allowed to remain in place approximately seven days. After the removal of the dressing, the tissues are found to be in the desired position and the flaps usually have healed firmly against the underlying bone. Although the surface of the gauze may be saturated with oral fluids after seven days, the odor of iodoform is still strong in the deeper layers and the gauze relatively clean.

■ *Summary*

The value of acrylic splints to aid in oral surgical procedures has been known for several decades. Natural teeth were used, however, for anchorage. A method has been needed to permit the use of splints in edentulous regions. A technic is described whereby acrylic splints and pressure gauze bandages are sutured directly to unelevated mucoperiosteum. Such splints are used after surgical procedures for oroantral fistulas and palatal tori.

■ Charity

The only thing which is of lasting benefit to a man is that which he does for himself. Money which comes to him without effort on his part is seldom a benefit and often a curse. . . . And so with regard to money or other things which are given by one person to another, it is only in the exceptional case that the receiver is really benefited. But if we can help people to help themselves, then there is a permanent blessing conferred.—*John D. Rockefeller, Sr. Random Reminiscences of Men and Events.*

Continuous intravenous sedation: its applicability in the dental office

■ *Morton J. Olin, D.M.D., Boston*

When administered in small dosages, the intravenous anesthetic agents have sedative, hypnotic and amnesic properties. When used in combination with local anesthesia, these properties can be useful in the dental office in properly qualified hands. Although deep sedation is achieved without the patient becoming unconscious, the technic should not be used by anyone untrained in the use of general anesthesia.

This paper is not designed to refute or find fault with any of the accepted technics now employed in the use of intravenous anesthesia; rather, it is to review another method by which oral surgical procedures can be carried out with safety and comfort.[1]

■ *Method*

A suitable vein is located and the intravenous needle inserted. A test is administered to determine the susceptibility of the patient to the drug (in the author's practice 1 to 2 cc. of 2 per cent thiopental sodium is used). After awaiting the subjective effects, if any, of the test dose, the initial dose is given; this should be a sufficient amount to place the patient at a well sedated and amnesic level. The amount may vary anywhere from 2 to 12 cc.

When the proper level is attained the patient will respond readily to instructions and suggestions. The patient is instructed to open his mouth, at which time a local anesthetic agent is injected to block out the nerve supply to the region in which the surgical procedure is to be performed.

Once the local anesthetic has taken effect, the patient is maintained in a sedated-amnesic plane throughout the remainder of the procedure. Intermittent dosages of the intravenous agent are given, and care is taken to maintain the patient somewhere between sleep and full awakening. The sedative effect is deepened when severe stimuli such as heavy traction or malleting must be employed. For very light stimuli such as suturing, no additional dosage is given. Thus the patient is in the deepest plane when he is receiving the greatest stimulus.

Essentially, this is the same method the psychiatrist employs when he wishes to produce periods of relaxation to overcome painful inhibitions.[2] There are two significant differences in an oral surgeon's use of the drug as compared with that of the psychiatrist: (1) The patient must be discouraged from speaking as it is neither the intention nor the desire of the surgeon to pry into the inner thoughts of

1. Thompson, E. C. Continuous pentothal sodium analgesia, with nerve block, in oral surgery: an analysis of 100 consecutive cases. J. Oral Surg. 3:205 July 1945.

2. Diethelm, Oskar. Treatment in psychiatry, ed. 3. Springfield, Ill., Charles C Thomas, p. 183-184.

an individual, and (2) the dentist is using the intravenous agent as a supplementary tool. One absolute precaution is that since the patient is in a suggestible state, any talking should be directed toward giving necessary instructions and making pleasant suggestions.

■ *Rationale*

Most patients are apprehensive, at least to some degree, when they are to undergo an oral surgical procedure. Even with adequate premedication, many patients under local anesthesia find that the awareness of what is going on is intolerable to them. Others have a definite block against allowing a needle to be inserted into their mouths. Many who certainly could tolerate surgical procedures under local anesthesia are, at the same time, extremely fearful of the procedure as it is going on. There are a few patients who object violently to the sensations of the local anesthetic agent itself. For this last group, the method described herein is of little value, since a local anesthetic is an integral part of the method.

In practice, great emphasis is placed on what the patient wants or does not want. This is justifiable within certain limits. The primary requirement for anesthesia is that it be safe; comfort, either to the patient or the operator is never as important a consideration. When the physical condition of a patient is such that any one of several agents can be used with equal safety, however, the over-all comfort of the patient and the operator becomes more significant.

The use of an intravenous agent with a local one offers a high degree of safety. Operations can be performed under relaxed conditions, and there is no special need for haste. The quantity of drugs given is minimal. The patient finds the anesthesia most pleasant, as he is in a euphoric state throughout.

■ *Discussion*

It is not within the scope of this paper to discuss the hazards of general anesthesia. There is a wealth of material published on this subject.[3,4] Certain problems will be discussed briefly.

RESPIRATORY EXCHANGE—With intravenous anesthesia, the respiratory exchange is diminished. This is less noticeable with intravenous sedation. In both instances, supplements of oxygen may be given if so desired.

LARYNGOSPASM—The incidence of laryngospasm is considerably decreased when the patient is in a sitting position, whether anesthesia or analgesia is used.[5] By proper management of the patient, laryngospasm can be controlled readily. Since, when the method described in this paper is used, the patient may slide readily into unconsciousness, it is mandatory that all anesthetic precautions be taken.

PROTECTIVE REFLEXES—With intravenous sedation, the protective reflexes such as coughing or gagging are maintained; thus the patient is left with his own devices for maintaining a patent airway.

3. Burstein, Charles L. Fundamental considerations in anesthesia. New York, Macmillan Co., 1949.

4. Guedel, A. E. Inhalation anesthesia; a fundamental guide, ed. 2. New York, Macmillan Co., 1951, p. 63-133.

5. Hubbell, A. O. Laryngospasm in oral surgery. J. Oral Surg. 12:286 Oct. 1954.

TEAMWORK—When intravenous anesthesia is administered in an office, and the patient is unconscious, a minimum of three people, operating as a team, is necessary.[6] With intravenous sedation, a two-man team, properly trained, can care for the patient adequately.

PREMEDICATION—A number of patients are extremely apprehensive before they arrive at a dental office. These individuals can be given premedication before intravenous sedation is administered. At times, however, it is preferable not to give a patient premedication before intravenous anesthesia.[5]

PREOPERATIVE INSTRUCTIONS — As with general anesthesia, instructions should be given the patient that the stomach must be empty at the time of operation.[7]

POSTOPERATIVE INSTRUCTIONS — In accordance with the rule for general anesthesia when utilized in the office, the patient should be accompanied by someone who will see to it that he reaches home safely.

RECOVERY TIME—Occasionally a considerable period of time is needed for recovery, particularly if premedication has been given, when intravenous anesthesia is used. With intravenous sedation, the recovery time for the patient is virtually immediate.

NAUSEA AND VOMITING—Nausea and vomiting appear to be practically nonexistent with intravenous sedation.

■ *Summary and Conclusion*

A method for office intravenous sedation combined with local anesthesia has been developed which has the following definite advantages. It has a high degree of safety; it can be given readily; it is pleasant for the patient; there is little danger of overdosage, and it has the desirable properties of sedation and amnesia.

The amnesic effect is unequivocal. The patient, while deeply sedated, has no fears and at the same time is fully cooperative.

It is difficult to ascertain whether an agent which produces sedation and amnesia is also analgesic. At any rate, a patient under the influence of intravenous sedation will withstand pain stimuli that he would not so readily tolerate while fully awake, yet when the surgical procedure is completed, the patient should be able to walk under his own power with little assistance.

It should be emphasized again that this method is not applicable unless the operator is familiar with the use of general anesthesia and is prepared to treat any anesthetic emergencies. — 29 *Commonwealth Avenue.*

6. Hubbell, A. O., and Krogh, H. W. Management of intravenous anesthesia to control recovery time. Oral Surg., Oral Med. & Oral Path. 9:403 April 1956.

7. Guedel, A. E. Inhalation anesthesia; a fundamental guide, ed. 2. New York, Macmillan Co., 1951, p. 89-91.

Treatment and prevention of emergencies incidental to the use of anesthesia and the antibiotics

■ *Leonard M. Monheim, D.D.S., M.S., Pittsburgh*

True emergencies incidental to the use of local anesthesia and the antibiotics in the dental office are not common; they are more common during the use of general anesthesia. An emergency may be defined as an unforeseen combination of circumstances which calls for immediate action. It is very possible that any dentist practicing general dentistry or any of the specialized branches may be precipitated into an emergency situation where immediate and proper treatment is necessary. This should not be interpreted to mean that every emergency endangers the life of the patient. It does, however, stress the need for early recognition and treatment before a situation becomes critical.

For example, a live wire lying in the street may present no immediate danger to any individual, but it does create an emergency situation because of the potential danger. By the same logic, a patient exhibiting the symptoms of a mild toxic reaction to a local anesthetic may be in no immediate danger, but the dentist cannot be sure of this, and the necessary steps must be taken to make certain that the reaction does not progress beyond the mild stage. Therefore, because of the necessity for immediate treatment, such a situation is termed an emergency.

During the course of practice many and varied complications may occur. A complication, which may be defined as any deviation from the normally expected pattern, during or following the use of anesthetics or antibiotics, is not an uncommon occurrence. Fortunately, however, all complications are not emergencies. Therefore, this paper will be confined to those complications which are emergent in nature, and must be treated as such.

In order to treat an emergency successfully the physiopathologic reason for its occurrence should be understood. The earliest symptoms of an emergency and its immediate treatment should both be readily apparent since the urgency of the situation does not permit a leisurely review of the problem. It is of equal importance that all offices be equipped to treat the emergencies most likely to occur. To many it may seem foolish to be prepared to handle a situation which may never happen. Once an emergency has occurred, however, it is too late to seek the necessary drugs and equipment, as in most instances the immediate treatment will determine the final outcome.

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Professor of anesthesia, University of Pittsburgh School of Dentistry.

With patients now demanding pain-free dentistry and since antibiotics are well accepted, the use of the anesthetic agents and the antibiotics has increased tremendously. This vast increase would in itself be sufficient to cause a proportionate rise in the number of emergencies. This does not mean that it is wrong to use the various anesthetics and the antibiotics when indicated, but that a dentist using them must be aware of the possibility of emergencies occurring.

■ *Emergencies with Local Anesthesia*

As local anesthetics are by far the most commonly used drugs in dentistry, the emergencies incidental to their use will be discussed first. These emergencies can be classified into two groups: those incidental to the needle insertion, and those attributed to the anesthetic solution.

FAINTING—Fainting, often referred to as syncope or neurogenic shock, is perhaps the commonest emergency in the dental office. It should be stressed that the loss of consciousness is not always the primary symptom of fainting.

When a patient, during the course of, or following the insertion of, the needle, complains of feeling faint or nauseated, an emergency situation exists in that some immediate action is necessary. It may require only the discontinuing of the injection; however, steps must be taken to see that the situation does not progress to the point that it is not easily reversible.

When, for reasons psychic or otherwise, the patient reacts by a partial loss of vasomotor tonus, the vascular bed increases, establishing a disproportion between the vascular bed and the circulating blood volume. This causes the blood pressure to drop, and the brain, specifically the cerebral cortex because of its superior position, shows the effect of the drop in pressure by a transient anemia and hypoxia with a loss of normal function. When and if this loss of consciousness takes place, the pulse, respirations, and color should be checked immediately in order to make certain that vital functions are present. If the pulse volume is satisfactory, although weak, with a normal rate and rhythm, and the respirations are sufficient to maintain a satisfactory color, it is quite certain that the patient has fainted—or at least is in no immediate distress.

Treatment—Any procedures in progress are discontinued, and the patient is laid back in the chair with the head as low as possible. Oxygen, which should be available in every dental office, is administered. Placing the patient back in the chair is preferable to bending the patient forward, as abdominal compression may interfere with normal respiration and circulation. In the vast majority of instances this is all that will be needed to revive the patient. The patient should then be re-evaluated to determine whether the dental work should be continued or terminated, since an episode of fainting may disturb some patients more than is apparent immediately.

The hasty use of analeptic drugs such as nikethamide, pentylenetetrazole, or caffeine and sodium benzoate, should be avoided unless their use is specifically indicated.

Prevention—The general condition of every patient should be evaluated before an anesthetic is given. It is advisable to inform all patients just what to expect, as many patients react poorly to unpleasant surprises. Needles and syringes should be kept out of view, but the patient should be informed exactly when the needle will be inserted. The extremely apprehensive patient should receive the benefits of psychotherapy and preoperative sedation when indicated.

NEEDLE BREAKAGE—When a needle breaks during its insertion, a true emergency exists. In such a situation it is important to remain calm and to take the proper steps immediately to avoid serious consequences. In most instances the needle will break at the hub. This should leave a sufficient length protruding from the tissues that can be grasped and removed with a suitable instrument, provided that an instrument is available immediately.

If the patient becomes alarmed and closes his mouth while a suitable instrument is being obtained, the action of the muscles may draw the needle into the tissues and out of sight. This situation may then require extensive surgery, since the original emergency, which could have been rectified easily with no ill effects, has been allowed to develop into a serious situation.

In the past few years the dental profession has insisted on finer and finer needles, and the sizes have progressed from no. 25 to no. 27 and, in some instances to no. 29 gauge. I believe that the use of anything above a no. 25 gauge is unwarranted and unsafe. Our research at the University of Pittsburgh has proved to us that a sharp no. 23 or no. 25 gauge needle can be inserted into the tissues as painlessly as a no. 27 or no. 29 gauge, and a great deal more safely. In addition to the greater safety that accompanies its use, the no. 23 gauge needle can be guided more accurately, and better anesthesia is the result.

The proper length needle should be selected for each injection. This should allow one third or one half of the needle, to protrude from the tissues, so that it may be readily grasped and removed with a suitable instrument in case of breakage.

No attempt should be made to change the direction of the needle while it is still imbedded in the tissues. In some instances the syringe is moved while the needle remains in place. This can easily cause it to break at the hub.

The needle should be advanced very slowly and under complete control of the operator at all times. To strike resistance suddenly may alarm the patient and sometimes even the dentist to the extent that a sudden movement by one or the other or both may cause the needle to break.

Needles, particularly the finer gauges, were never meant to be forced into bone. It is a cardinal rule of injection technics that when any resistance is met, the operator should withdraw the needle and reinsert it. For intraosseous technics, a pathway should be made by a suitable instrument before the needle is inserted.

Needles, like any other objects, have a period of maximum efficiency. To attempt to use the same needle over and over again is poor economy, as constant use may weaken it and eventually cause it to break.

EMERGENCIES ATTRIBUTED TO ANESTHETIC SOLUTIONS—Emergencies may be caused by toxic, idiosyncratic, allergic or anaphalactoid reactions.

Toxic Reaction—A toxic reaction to a local anesthetic occurs when a blood level is reached that is sufficient to affect vital centers. All local anesthetics are capable of causing toxic reactions, and when it is remembered that six times more of the agent is required to produce local anesthesia than is needed to induce a systemic reaction in certain circumstances, it is not difficult to understand how easily a toxic dose may be administered.

It should be understood that, whereas the alkalinity of the tissues affects the water soluble anesthetic salt and separates the alkaloidal base from the acid radical. the actual hydrolysis and detoxification of the anesthetic does not take place until the drug is absorbed into the circulation, where it is hydrolyzed by the plasma esterase and then further detoxified by the liver.

When the absorption into the blood stream is more rapid than the hydrolysis and detoxification, a blood level may be reached which will affect those centers most susceptible to the drug.

All local anesthetics, with the exception of lidocaine, are early central nervous system stimulants, and the first symptoms of toxicity are talkativeness, apprehension and mild excitement.

Any time during the administration of a local anesthetic that the patient exhibits the symptoms listed, a toxic overdose has been given. This requires the immediate cessation of the administration, or, if the total volume has already been injected, the patient must be observed closely and immediate action taken to prevent more serious manifestations. These preventive steps are the administration of oxygen and the use of intravenous barbiturates, probably pentobarbital or seconal.

In all instances, central nervous system stimulation will be followed by proportionate degree of depression – the greater the stimulation, the greater the depression. If the stimulating phase has been sufficiently severe to produce convulsions, the corresponding depression may be equally pronounced, resulting in respiratory depression or cessation, and, if not treated, cardiac arrest from hypoxia.

Fortunately, the vast majority of patients respond to the immediate administration of oxygen alone. If not, it is essential that any convulsive seizures be prevented or terminated at the earliest moment by the intravenous barbiturates, in addition to inhalation of oxygen.

Practically 100 per cent of all emergencies resulting from toxic overdose are caused by the inadvertent intravascular administration of the anesthetic solution. The ordinary dosages, as used in dentistry, are well within the limits of safety, and it is doubtful if the solution, particularly since it contains a vasoconstrictor, could be absorbed into the circulation rapidly enough to cause a systemic reaction. On the other hand, the inadvertent intravascular administration would immediately place in the blood stream a volume and concentration in excess of that needed to produce a toxic reaction.

To prevent toxic reactions, the following rules should be remembered:

1. Aspiration is carried out before injection is begun.

2. After the aspiration, the injecting is done slowly.

3. The least possible volume of anesthetic solution is used.

4. The weakest possible concentration is used.

5. A solution containing a vasoconstrictor is always used unless specifically contraindicated.

6. The operator must stay well within the limits of toxic doses.

7. Premedication with barbiturates is utilized, but it cannot be depended on to eliminate toxic reactions.

8. For deep injections, a good, sharp no. 23 gauge needle is used, as it will be more difficult to penetrate a small vessel, and aspiration will be more easily accomplished.

Idiosyncratic Reaction—If an idiosyncratic reaction occurs, all the manifestations of toxic overdose will be exhibited although only a minute amount of the drug has been administered. Actually, idiosyncrasies are rare, and in most instances what has been mistaken for an idiosyncratic reaction has been an intravascular injection. The treatment for such reaction will be exactly the same as that for toxic overdose, as the physiopathologic condition is identical.

This particular type of emergency can be avoided by following certain procedures:

1. A preanesthetic history of the patient should be taken and evaluated, and previous experiences noted.

2. If there is a history of an idiosyncrasy, the patient should not be given local anesthetics on extremely hot days, as such emergencies seem most likely to occur under these conditions.

3. Volumes and concentrations of drugs should be kept to a minimum, and if an idiosyncrasy is suspected, drugs of a different chemical derivation than those previously used should be administered if possible.

It should be remembered that an idiosyncrasy does not persist, and the patient may vary from day to day in his ability to cope with a particular drug.

Allergic Reaction—An allergy is an antigen antibody type of reaction exhibited through a particular organ, most likely skin or mucous membrane. The allergy may be acquired or familial. In all instances of acquired allergy, the patient must have been previously sensitized to the particular drug or a similar chemical compound.

The symptoms of an allergic reaction are urticaria, angioneurotic edema, rhinitis or asthmatic symptoms.

The allergic reactions to local anesthetics fortunately are rare; in fact, less than 1 per cent of all reactions. This type can, however, create a serious emergency, and fatalities have not been unknown.

In all instances, the first 0.25 cc. should be injected very slowly, after which there should be a 10 to 15 second pause. If no reaction takes place, 0.5 cc. can be injected slowly with another pause. If there is still no reaction, the remainder of the cartridge may be injected slowly.

This procedure is advocated, as it causes no inconvenience and insures

against a violent reaction by the patient. This is important when it is considered that no one can say for certain when a patient has become sensitized to a particular drug. A previous injection may have been the sensitizing dose. Fortunately, in practically all instances of recent sensitization, the reaction is not too severe, and the initial 0.25 cc. may be sufficient to demonstrate it.

An allergic reaction can be treated best by intravenous or intramuscular administration of benadryl in 20 mg. dosages. It is important that only the primary emergency treatment be given to safeguard the immediate welfare of the patient. Further treatment of any allergic manifestations should be handled by an allergist or a competent physician of the patient's choosing.

The best prevention for emergencies of allergic origin is the following:

1. A preanesthetic history should be taken and evaluated.

2. Any history of previous allergy should not be disbelieved.

3. When the offending drug is known, one of a different chemical derivation should be used, and then cautiously.

4. When the offending drug is not known, an allergist should be called in for consultation. He should test the patient's reaction to the various drugs. It is essential to bear in mind that an already sensitized individual may react most violently even to the test dose, if not properly handled.

If a patient exhibits allergic symptoms to a particular local anesthetic or antibiotic, the situation should be explained to the patient and the name of the offending drug written on a card so that he may use it for his own safety, and thus be able to inform any subsequent dentist or physician of the exact drug to which he is allergic.

Unfortunately, all local anesthetics are Novocaine to a majority of laymen, and where previously it would have been correct to assume that procaine hydrochloride had been the offending drug, this assumption is no longer valid.

It should be noted, however, that what is frequently interpreted as an allergic reaction may not actually be one. Failure to secure anesthesia, or the occurrence of dizziness or nausea are not allergic manifestations. However, written information concerning a diagnosis of an allergic reaction that is given to the patient may possibly save his life and prevent some other dentist from experiencing a very severe emergency.

Anaphylactoid Reactions—An anaphylactoid reaction is, in all probability, the most serious emergency that could happen in the dental office. It is characterized by a sudden vasomotor collapse, and it may be impossible to feel the pulse or determine the blood pressure. In the event of an anaphylactoid reaction, the most rapid and proper treatment may not be sufficient to reverse the condition, and the patient may die. If an intravenous sympathomimetic amine can be given instantly, which is sometimes not soon enough, the condition may be reversed. Mephentermine and phenylephrine are the drugs of choice, in dosage of 0.5 cc. for mephentermine and .25 cc. for 1 per cent phenylephrine.

■ *Complications with Vasoconstrictors*

Vasoconstrictors are an integral part of practically every anesthetic solution used in dentistry. Untoward reactions to these vasopressor drugs may occur, as well as to the anesthetic drugs themselves. Undoubtedly many untoward systemic reactions are attributed to the local anesthetic drugs when actually the vasoconstrictors are the offenders.

A systemic toxic reaction is manifested when a sufficiently high blood level is reached. This blood level, as is true with local anesthetic drugs, is variable. What may produce symptoms of toxic overdose in one patient may not disturb another.

The same factors governing the rate of absorption, breakdown and elimination hold for the vasopressor drugs as for the local anesthetics. Also, as with local anesthetics, the vast majority of untoward reactions of any consequence stem from inadvertent intravascular injection.

The symptoms of toxic overdose are palpitation, tachycardia, hypertension and headache.

The patient may become fearful and apprehensive. It is felt that fear and apprehension are not so much the result of any direct effect on the central nervous system, as occurs with the local anesthetic drugs, as they are an accompaniment of the palpitation and anxiety. The reaction may be described by stating that the patient has the feeling that all is not well.

As with any other emergencies, prevention is better than treatment. In the past, and often today, the concentrations of the vasopressor drugs have been excessive. In the case of epinephrine, which is the most efficient of all the vasopressors, a 1:50,000 concentration would equal .02 mg. per cubic centimeter. This is a safe dosage when administered into the tissues, but the same amount inadvertently given intravenously may create an emergency. It is doubtful if any other drugs used in dentistry are safer when given intramuscularly, but more dangerous when given intravenously.

The prevention of any emergencies arising from the use of the vasoconstrictors would depend on taking the following precautions:

1. The vasopressors should not be used when they are specifically contraindicated, as for example when a patient has a thyrotoxic condition.

2. Aspiration is carried out before injection of drug.

3. Reasonable concentrations are used, and the over-all volume to be injected must be considered.

4. Any vasoconstrictors in addition to the autogenous epinephrine released must be considered.

■ *General Anesthesia*

A much greater percentage of the complications occurring during general anesthesia are emergent in nature, in that they require immediate treatment. During general anesthesia a minor complication which may seem unimportant could, by neglect, become a serious emergency.

Only the more common emergencies that occur during general anesthesia will be discussed. Emergencies may affect one or more of the respiratory, cardiovascular, nervous or gastrointestinal systems.

The vast majority of emergencies occurring during anesthesia for oral surgery are primarily respiratory in nature, and induce a degree of hypoxia or, if severe enough, anoxia. This oxygen lack may in turn create emergencies involving the circulatory, nervous, or gastrointestinal systems.

RESPIRATORY SYSTEM—Any interference with the exchange of gases, oxygen, and carbon dioxide between the external atmosphere or anesthetic machine and the body cells constitutes an emergency which, if not corrected, may, over a short period of time, lead to dire consequences. The most common respiratory emergencies arise from obstruction, mechanical or physiological; inadequate percentage of oxygen in the gas mixtures; inefficient carbon dioxide elimination.

The most common emergency in anesthesia, particularly in oral surgical procedures, is mechanical obstruction. This may come about in many ways and is a problem because the anesthetist and the oral surgeon are literally at work in the same area—the anesthetist is doing his best to keep the chin up to facilitate the patient's breathing, while the oral surgeon is exerting downward pressure on the mandible to facilitate removal of molar.

Blood, mucus, or debris, if allowed to accumulate in the postpharynx, may create a serious obstruction to the respiratory pattern. A seemingly insignificant interference may reduce the inspired volume by as much as 50 per cent. This, at first, may seem harmless, but as the oxygen deficiency increases, circulatory, nervous, and gastrointestinal system emergencies may be initiated.

The most common physiological obstruction is laryngeal spasm. This consists of a spastic adductor contraction of the vocal cords. If the spasm is complete, the ingress of air is completely blocked. When a spasm occurs, there is very little, if any, doubt as to the diagnosis, and once this condition has been witnessed, the symptoms will never be forgotten. The patient makes every effort to breathe, but without success. The abdominal muscles work spastically, while the thoracic cage is unable to increase its capacity.

Previously, this would have constituted a very serious emergency. Since the introduction of the muscle relaxants, however, particularly succinylcholine chloride, this emergency no longer holds the terror for anesthetists that it once did. As a laryngeal spasm is most likely to occur with intravenous anesthesia, the succinylcholine can be introduced through the same needle, thus relieving the spasm in a matter of seconds. It is frequently necessary to augment the breathing or breathe for the patient, as the succinylcholine may paralyze the patient's respiratory muscles.

A laryngeal spasm is most often caused by irritation of the vocal cords or by extremely painful stimuli while the patient is in too light a plane of anesthesia. This emergency can be prevented by keeping the postpharynx free of blood, mucus and debris, and by properly conditioning the patient to any stimuli if the operative procedures are to be performed in a plane of light anesthesia.

CARDIOVASCULAR SYSTEM—In practically all instances, cardiovascular emergencies during anesthesia for dental procedures are secondary to a respiratory

complication. The cardiovascular emergencies are in most instances manifested by a tachycardia or a bradycardia. The hypoxic state, if allowed to continue, may then produce other cardiac arrhythmias, and may even terminate in cardiac arrest. Practically all instances of cardiac arrest are secondary to unrecognized and untreated hypoxia.

The treatment and prevention of the cardiovascular emergencies are, as a rule, very simple. They consist of making certain that the patient has adequate oxygen at all times. At no time should the patient's oxygen intake be below that required to maintain the normal physiologic metabolism.

NERVOUS SYSTEM—As with cardiovascular emergencies, practically all nervous system emergencies are secondary to respiratory emergencies. The most common nervous system emergencies are manifested by jactitation or convulsions. Here again, adequate oxygenation will both treat and prevent the condition.

GASTROINTESTINAL SYSTEM — The most common gastrointestinal emergency during anesthesia is vomiting. This can be a very serious emergency, particularly if the vomitus is aspirated or otherwise causes a respiratory obstruction.

If a patient vomits during anesthesia, it is in the second stage during the induction, or in the same stage during recovery.

Vomiting calls for immediate and prompt action. The head and body must be lowered immediately, and suction used to remove the vomitus from the posterior pharynx and the air passages.

This is one particular emergency which is much easier to prevent than to treat. Any patient who is to be given an anesthetic should be without food or water for at least four to six hours prior to the appointment. This is particularly applicable to dentistry, since there is no situation sufficiently urgent in dentistry to warrant risking a lung abscess or even cardiac arrest so that the dental work might be done at a particular time.

If a patient is having severe pain and has eaten recently—within four to six hours—the narcotics or analgesics can be prescribed to relieve the pain, and the anesthetic given a few hours later. Sir William Osler must have had this situation in mind when he said, "The treatment should not be more hazardous than the disease."

■ *Antibiotics*

The management of the allergic response to the antibiotic drugs is essentially the same in principle as the treatment of any other type of drug reaction.

A discussion of this subject can be logically divided into two major sections: (1) prevention of allergic reactions: (2) management of allergic reactions to the antibiotic drugs.

PREVENTION OF ALLERGIC REACTIONS —The antibiotic which is involved most frequently in sensitivity reactions is penicillin, although it must be remembered that every antibiotic in use today is capable of causing such a reaction. Before administering or prescribing any of the antibiotic preparations, the patient's history should be obtained. The most important questions to ask the patient are:

1. Have you ever taken this drug

before? If so, was there any untoward reaction?

2. Are you allergic to any other drugs?

3. Have you ever had asthma, hay fever, or dermatitis?

4. Have you ever had a severe fungus infection?

Patients who have asthma or hay fever are more likely to have an allergic response to penicillin. In addition, patients who have had a fungus infection for a prolonged period may show a cross sensitivity to penicillin. It must also be remembered that each time a reaction occurs to a given drug, it increases in severity, so that the patient who had only a mild rash the last time that they had penicillin therapy, may very well have an anaphylactoid type of reaction from the next dose. If a patient manifests even a questionable reaction to penicillin, the drug should not be used again unless it is a matter of complete urgency where no other drug can be substituted.

MANAGEMENT OF ALLERGIC REACTIONS—Two types of allergic reactions must be considered—immediate and delayed responses. There is a great deal of variation in the severity of sensitivity reactions to the antibiotic drugs. The reactions may affect the skin, respiratory system, or the cardiovascular system. Dermatitic reactions are treated symptomatically with antihistamine preparations and topical application of the antihistamine anesthetic lotions. Reactions involving the respiratory system require the administration of oxygen, as well as the possible use of epinephrine, aminophyllin or cortisone. Reactions involving the cardiovascular system require supportive therapy to prevent complete collapse. Since many of the antibiotic preparations used are designed to maintain a level over a long period of time, there may be continued absorption of the drug for many days. This may require intensive therapy for several days, until all absorption of the drug from the site of injection has ceased.

It must be kept in mind that severe allergic reactions have occurred with oral administration of penicillin, although these occur more rarely than do the reactions to the parenteral administration. The practice of administering one of the injectable antihistamine preparations at the time the penicillin is given has proved moderately effective. Statistics indicate that the number of severe allergic responses can be reduced but not eliminated.

With rare exceptions, most allergic responses to penicillin that have terminated fatally have been preceded on other occasions by a milder type of reaction to the same drug. It must be concluded, therefore, that the best preventive measure to adopt is to obtain a good history of the patient prior to the prescription of the antibiotic drugs.

■ *Comment*

Although emergencies incidental to local and general anesthesia and the antibiotics are not common, they will occur more frequently if specific safeguards are not taken at all times. The dentist cannot afford to forego adequate basic technics and good judgment. Fortunately, to the well trained dentist these are almost automatic, as he is always conscious of the welfare of his patient.

Aspiration before injection of dental local anesthetics

■ *S. C. Harris, Ph.D., Chicago*

It is common practice, as a deliberately cultivated habit, for physicians and nurses to ascertain if the point of a hypodermic needle is in a blood vessel before an injection is given. Deliberate intravascular injection is always preceded by aspiration of blood into the syringe. It must follow, therefore, that deliberate extravascular injection must be preceded by failure to aspirate blood.

There are good reasons why inadvertent intravascular injection must be scrupulously prevented. Any drug is dangerous in overdosage. Overdose means too high a concentration of drug at some responsive site or sites. This occurs when the rate of entrance to the site exceeds the ability of the tissue or system to tolerate, adjust to and destroy, or otherwise inactivate the drug.

Prominent among the reasons for giving a dose of a drug by the intramuscular or subcutaneous routes for a general systemic effect is the moderate rate of entrance into the circulation, with the resulting moderate and sustained blood level. If the same dose is injected intravenously at the same rate, the blood level is elevated more rapidly to a much greater concentration. Either of these features are dangerous. Occurring together, the hazard is compounded and disaster is invited.

To avoid such catastrophic possibilities, aspiration must be attempted before any extravascular injection is begun. If no blood is withdrawn, injection may proceed, as long as the needle is not moved. Movement of needle dictates aspiration after each move.

As an additional precaution, traditional discipline in therapeutics is to inject slowly minimal effective quantities and concentrations. Once the drug has entered tissue, it cannot be recalled.

When blood is aspirated into a syringeful of solution intended for extravascular injection, it is prudent to discard it and start anew. Blood reacts with some solutions (including local anesthetics) to form precipitates which, in the extravascular regions, act as foreign bodies and in the vascular tree are emboli.

Among the reasons why aspiration is not practiced universally in dentistry, three should be examined thoughtfully and objectively: (1) It is evidently thought by some that, when a needle point is in a blood vessel, blood will enter or can be "teased" into a nonaspirated cartridge; (2) so little has been said about it in the literature that many dentists believe the incidence of puncturing blood

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vessels is insignificant in dental injections; (3) the hazards of intravascular injection are not sufficiently appreciated by the profession.

It is the purpose of this paper to present some facts which bear on the first two of the afore-mentioned reasons and, hence, place the established ideas about the third reason in a different light.

■ *Entrance of Blood in Nonaspirated Cartridge*

To determine the circumstances in which blood will enter a cartridge in a nonaspirating syringe, some simple experiments were performed. The equipment consisted of colored water contained in a rubber tube which was under an easily regulated and accurately recordable pressure.

The first experiment was to see how much pressure must be in a blood vessel to force blood into a cartridge through a regular injection needle. Because a water solution is less viscous than blood, values obtained in this system are less than if blood were used. Five cartridges were taken from each of two cans from each of four major manufacturers of dental anesthetic cartridges. They were inserted in a cartridge syringe fitted with a 25 gauge needle 1½ inches long from tip to tip. The needle was then inserted into the lumen of the rubber tube containing water. Pressure in the tube was increased by 20 mm. of mercury every 30 seconds. The cartridges of each of three manufacturers' lines showed no dye even when 280 mm. mercury pressure was in the tube. Ten cartridges of a fourth line ranged from 80 to 160 mm. mercury with an average of 116 mm. mercury.

The second experiment was to find the minimum pressure necessary in the tube to cause dye to flow into the cartridge when the plunger was compressed slightly and released. To obtain the values presented here, the author repeated such efforts many times at each 10 mm. increment of pressure to be certain backflow could not be achieved.

The ranges and average pressures in the rubber tube substitute for a blood vessel necessary to permit the slightest trace of dye to be "teased" into the cartridge are presented in tabular form below.

Mfr.	Tube pressures: range	In mm. mercury: mean
A	60-180	109
B	40-60	46
C	30-120	88
D	0	0

It is evident that the products of three of the manufacturers have plungers with enough resistance against the cartridge wall to prevent any ordinary arterial blood pressure from forcing blood back into the cartridge. Though some of the cartridges had small gas bubbles within, no appreciable difference in pressure was observed.

When the rubber plunger was compressed and released to permit aspiration, success was variable and unreliable and, even then, was attained only when the pressure in the artificial blood vessel was arterial in magnitude. Success depends on the relationship between friction of the plunger on the cartridge wall, compressibility of the plunger, the gauge and length of the needle, and the pressure opposing the cartridge contents. These remarks apply to products A, B, and C.

Table
Frequency of penetration of vascular bed during dental injections

Type of injection	Number of injections		Aspiration positive	
	Total	Aspiration attempted	Number	Per cent
Infiltration	4,661	2,778	56	2.02
Mandibular	4,813	3,085	111	3.60
Zygomatic	1,159	827	36	4.35
All others	2,720	1,844	68	3.69
Total	13,353	8,534	271	3.18

Product D was different in both experiments because it had the unique plunger designed by Jorgensen.[1] This plunger is hollow with a compressible dome in contact with the syringe plunger. It was designed to permit aspiration and in our studies was found to work fairly well. Blood is not aspirated as reliably as colored water, however, and the longer the needle or the smaller its diameter, the less reliably it permits aspiration of blood. Evidently the idea is excellent, but the dome needs to have larger volume and more resilience.

The frequency of penetration of the vascular bed during dental injections may be estimated from experience obtained at the Northwestern University Dental School Clinics where injections of local anesthetic solutions are given with all glass luer-type syringes. The table indicates the frequency.

The data in the table show that inadvertent intravascular injection may occur during any dental injection. Indeed, it is about twice as likely to occur during a zygomatic injection as during an infiltration, but it is unavoidable. Accuracy, skill, and experience in making injections will not alter these facts. Where there is living tissue, there is vascularity and the smaller branches are abundantly and randomly distributed.

■ *Systemic Reactions*

What are the consequences of intravascular injection of a dental local anesthetic solution? The most obvious and, at the same time, the most innocuous is failure to obtain the anticipated local anesthesia. If the injection leaves the site promptly through a blood vessel, no anesthesia can be produced. Many dentists have commented on the high degree of coincidence between anesthetic failure and "untoward" reactions—presumptive evidence that intravascular injection had occurred.

A number of factors determine the severity of systemic reactions induced by intravascular injection of local anesthetic solutions. They are:

1. The chemistry of the agent and its rate of administration, concentration, volume, fate in the body (that is, rate of destruction or elimination), and proportion to vasoconstrictor.

2. The history of the patient—will the patient adjust satisfactorily to the insult?

Of the two possibilities of intravascular injection, intra-arterial is probably less hazardous. This is particularly so if there

1. Jorgensen, N. B. Accidental intravenous injection of procaine in dentistry. J. South. California D.A. 20:17 Sept. 1952.

is a vasoconstrictor in the solution because it will cause arterioles to constrict, thereby reducing the rate of entrance of the drug into the capillaries and venous components. (This is the same reason that vasoconstrictors intensify and prolong anesthetics while they reduce toxicity of local anesthetic solutions properly placed.) Symptoms of intra-arterial injection are well known—anesthesia and blanching (if a vasoconstrictor is present) are seen in the region vascularized by the artery.

Intravenous injection of local anesthetic solutions, on the other hand, is an invitation to disaster. Adriani[2] has pointed out that systemic effects of local anesthetics occur only when the drug enters the circulation. In the usual situation of regional anesthesia, the drug enters the circulation slowly enough to create blood levels too low to produce systemic effects. When the drug enters the circulation fast enough, either by direct injection or by rapid exodus from the anesthetized region, systemic effects are manifest.

Sadove[3] and co-workers classified the reactions to local anesthetics. These reactions may be due to stimulation of the central nervous system, with symptoms varying in degree from verbosity to violent convulsions. Depression of the central nervous system with loss of consciousness and depression of the vasomotor and respiratory centers may occur without or intermittently with convulsions.

Peripheral effects may also occur, independently of or coincidentally with the afore-mentioned reactions. There may be sudden peripheral vascular collapse or depression of cardiac activity or both. Uhley and Wilburne[4] describe a "chaotic heart action" after administration of procaine.

The severity, duration, outcome and sequelae to such episodes vary from trivial to fatal, the determining features being the relation between blood concentration and patient sensitivity, as well as ability to withstand and recover from the insult. Such effects also may occur after extravascular injection, but only if the drug enters the circulation too rapidly. This may occur when no vasoconstrictor is employed or when its benefits are overcome by too rapid, too forceful or too voluminous an injection.

How often the outcome of these reactions is lethal can only be vaguely estimated. Seldin and Recant[5] conservatively estimate the incidence of deaths due to dental local anesthetics (over a 10 year period in New York City) at one per 25,000,000 to 50,000,000 injections. They cite others who believe the mortality rate to be higher. Documented in the literature are more than 100 deaths.[6] In any case, it seems fair to assume that other such unfortunate accidents never reach the records. Albeit the fatal incidence is low, 0.000002 per cent,[5] the patient is 100 per cent dead. If any of these deaths might have been prevented by ordinary or even extraordinary precautions, that they occurred at all seems inexcusable.

One of the most insidious dangers in therapeutics is the complacency which develops when undesirable reactions are infrequent. With local anesthesia, this com-

2. Adriani, J. Local anesthetics. Seminar Report (Merck, Sharp & Dohme) Fall 1956, p. 19-27.

3. Sadove, M. S., and others. Classification and management of reactions to local anesthetic agents. J.A.M.A. 148:17 Jan. 5, 1952.

4. Uhley, M. H., and Wilburne, M. Effect of intravenous procaine on electrocardiogram of the dog. Am. Heart J. 36:576 Oct. 1948.

5. Seldin, H. M., and Recant, B. S. Safety of anesthesia in the dental office. J. Oral Surg. 13:199 July 1955.

placency is intensified by the knowledge that procaine is given intravenously by intention in certain medical procedures. When this procedure is employed, the patient is hospitalized, recumbent, and emergency equipment and drugs are instantly available.

Barbour and Tovell,[7] during an early study of intravenous procaine therapy, declared the maximum safe rate of administration to be 1,000 cc. per hour of 0.1 per cent solution. This is at the rate of 16.6 mg. per minute. A 2 per cent solution of procaine contains 20 mg. per cc. If this latter solution is injected as slowly as 2 cc. per minute, it would be about two and one half times faster than Barbour and Tovell's maximum safe rate. If the general rule is true, that as concentrations of drugs increase arithmetically, toxicity increases geometrically, then 2 cc. of 2 per cent procaine per minute would be about 6.25 times more toxic than 16.6 mg. per minute.

Less than fatal reactions probably occur many times more often than the fatal. Even the mildest of these can be frightening both to the patient and the dentist, and the more severe may produce persisting damage. It is recognized that as local anesthetic solutions of greater potency than procaine become ever more widely used in dentistry, the hazard probably increases, because the toxicity of these drugs is most probably a function of their anesthetic activity.

■ *Conclusions*

Three guiding facts indicate that deliberate aspiration should be practiced routinely before injection of dental local anesthetics. First, dental local anesthetic solutions injected intravascularly are a hazard to the patient, and on rare occasions, reach a lethal magnitude. Second, when the usual dental injections are practiced, the vascular bed will be entered about 32 times per 1,000 injections. Third, unless the plunger of the injection syringe (or cartridge) is slightly but positively withdrawn, the presence of the needle in a blood vessel cannot be known reliably.

Aspiration takes a fraction of a second. At the time of this writing, aspirating cartridge syringes or the "Gabriel" luer-type syringe provide all the convenience of cartridges with the additional advantage of increased safety for the patient.

This procedure affords additional advantages to the dentist in fewer anesthetic failures, fewer anesthetic reactions, fewer frights, and opportunity to rinse the injection needles before sterilization.

7. Barbour, C. M., and Tovell, R. M. Experiences with procaine administered intravenously. Anesthesiology 9:514 Sept. 1948.

■ Magic and Science

Magic is essentially unprogressive and conservative; science is essentially progressive; the former goes backward; the latter, forward.—*George Sarton, Introduction to the History of Science.*

Acinic cell tumor of the major and minor salivary glands

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The rare tumor of salivary glands variously called adenoma, serous cell adenoma, acinar cell tumor, acinic cell adenocarcinoma, clear cell carcinoma, serous cell adenocarcinoma and glandular epithelioma has been recognized for over 30 years. Although there is no unanimity of opinion concerning its name or malignant propensity, there seems to be general agreement on its histogenesis. Because of the close similarity between the cells of this neoplasm and those of the serous acini of normal salivary glands, this tumor is commonly referred to by the descriptive terms of "acinic cell" or "serous cell."

Heretofore, there has been little record of acinic cell tumors occurring in the minor salivary glands of the oral cavity. Bernier[1] in his recent text stated that he had seen a serous cell adenoma in the retromolar region in a 26 year old white woman. Bhaskar and Weinmann[2] in their collection of minor salivary gland tumors do not seem to have come across this variety. In their extensive survey, Foote and Frazell[3] observed an incidence of 21 acinic cell adenocarcinomas in 877 tumors (2.3 per cent) of the major salivary glands. All occurred in the parotid gland. They did not observe any cases occurring in either of the other major or minor salivary glands. It is, therefore, rather apparent that occurrence in glands other than the parotid is exceedingly rare.

■ *Histopathology*

There is noticeable similarity between many of the cells of this tumor and those of serous cells of normal salivary glands. The individual cells are polyhedral or rounded with distinct, delicate cell membranes. Their granular cytoplasm is faintly basophilic. The granules, usually fine, sometimes approach the size of fully mature zymogen granules. The nucleus is small, eccentrically placed, and usually exhibits a nucleolus of insignificant size. Other cells are water clear and may exhibit a pseudoglandular, papillary, or cystic arrangement that resembles cells in adenocarcinoma of the kidney. Neither mucus nor fat has been observed in this tumor, but a Schiff stain demonstrates either zymogen or the glycoprotein precursor of zymogen. These features are shown in the illustration.

■ *Clinical Behavior*

Foote and Frazell[3] indicated that two thirds of their cases of acinic cell adeno-

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1. Bernier, J. L. Management of oral disease. St. Louis, C. V. Mosby Co., 1955.

2. Bhaskar, S. N., and Weinmann, J. P. Tumors of the minor salivary glands. (Study of twenty-three cases.) Oral Surg., Oral Med. & Oral Path. 8:1278 Dec. 1955.

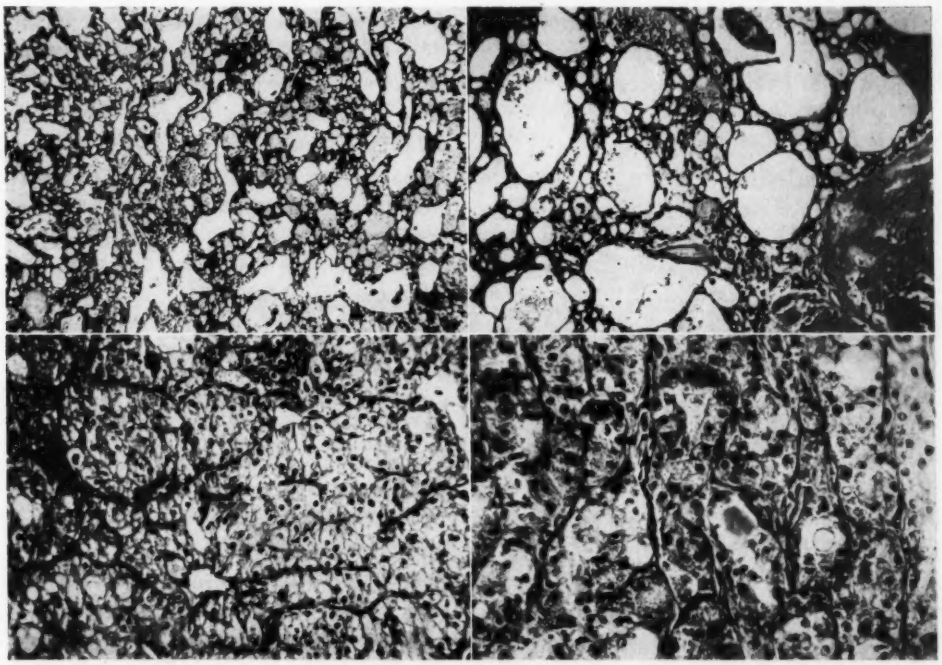
3. Foote, F. W., Jr., and Frazell, E. L. Tumors of the major salivary glands. Section IV, Atlas of tumor pathology. Washington, D. C., Armed Forces Institute of Pathology, 1954.

carcinoma were found in women. Although it occurred over a wide range of ages, it was found most frequently in the fifth and sixth decades.

The tumor is usually rounded and encapsulated. It is rather slow growing but recurs frequently when removed. The recurrence showed less evidence of encapsulation. Characteristically, metastases, when they occur, are found in the lungs, bones and brain. Regional metastases to the cervical nodes are quite uncommon.

Buxton, Maxwell and French[4] have divided this tumor into two categories, which they have labeled serous cell adenoma and serous cell carcinoma. Of the former category, they presented seven examples. They found the tumors to be slow growing, six having been present from 3 to 18 years. One, however, was noted only four months prior to examination. Five of these patients were alive and well, one died without evidence of the tumor, and one was alive with questionable recurrence of the tumor.

4. Buxton, R. W.; Maxwell, J. H., and French, A. J. Surgical treatment of epithelial tumors of the parotid gland. Surg., Gyn. & Obst. 97:401 Oct. 1953.



Above left: Low power view of pseudoglandular variety of acinic cell tumor. Note Swiss cheese appearance of tissue. Above right: Higher power view of section seen above left. Walls of cystic spaces consist of compressed epithelial cells. At lower right is a bit of hyalinized connective tissue. Below left: Epithelial cells are arranged in acinar groups, separated by thin, delicate connective tissue septa. Stroma contains thin-walled capillaries. Note similarity of neoplasm to hypernephroma. Below right: Epithelial cells are arranged in acinar groups. Cells are polyhedral in shape and contain zymogen granules

Their latter category, serous cell carcinoma, was separated from adenoma in part on the basis of cell grouping. In adenoma, the cells occurred in medullary groups. In their carcinoma category, the cells occurred in well formed glands. They pointed out that normal histopathologic criteria for malignancy could not be used in regard to serous cell carcinoma. Five cases fell into this category. In each, the patient was a woman over 50 years. In three instances the tumor was slow growing (four to nine years), which the investigators felt suggested origin in a benign tumor. Four of the five patients died with extensive metastases. One, after extensive radical surgery, was apparently free of the disease. Characteristically, there was no local metastasis noted.

■ *New Material*

In the selection of this material, only those tumors which were basophilic and elaborated no mucin were accepted within this category.[5] Salivary gland tumors classified as clear cell tumors, adenomas, acinar cell tumors, serous cell tumors and so forth were reviewed and 17 cases selected from the files of Columbia University, surgical pathology division, and the University of Minnesota, oral and surgical pathology divisions.

Of the 17 patients, seven were not able to be followed. Of the remaining ten, five (50 per cent) have been free of the tumor from 5 to 20 years. Cervical metastasis occurred in only one of five instances. Metastases in the other four were found in the abdominal skin, liver, lungs and the frontal lobe of the brain. Local recurrence was noted in two of the instances.

In about half of the instances the tumor was well encapsulated. In those which recurred, encapsulation was less well marked, which is in agreement with the observation of Foote and Frazell.[3] However, there did not seem to be any correlation between encapsulation and the ability of the tumor to metastasize.

Nine of the 17 instances occurred in women, an incidence of 53 per cent. The ages ranged from 13 to 72 years, being most common in the fifth and sixth decades. This observation is also in agreement with those of Foote and Frazell.

Fifteen of the 17 instances occurred in the parotid salivary gland. One instance was noted in the sublingual salivary gland of a 63 year old man and another arose in the minor salivary glands of the tongue in a 34 year old man. No conclusions can be drawn concerning the behavior of extraparotid acinic cell tumors. The latter had local recurrence and distant metastases within four years, whereas the patient with the sublingual gland tumor has been tumor-free for nearly 20 years.

■ *Summary*

Seventeen cases of acinic cell tumor of the major and minor salivary glands are reported. Fifteen were found in the parotid gland, one in the sublingual gland and one in the minor salivary glands of the tongue. Of the ten cases that were followed, metastasis occurred in five (50 per cent). There appeared to be no relation between encapsulation and the ability of this tumor to metastasize. There appeared to be no sex difference, the most common age being the fifth or sixth decade.

5. Godwin, J. T., and Colvin, S. H., Jr. Adenoma of parotid gland. Arch. Path. 46:187 Aug. 1948.

Surgical correction of chronic dislocation of the temporomandibular joint not responsive to conservative therapy

■ *William B. Irby, D.D.S., M.S., Denver*

The management of chronic subluxation and dislocation of the temporomandibular joint is frequently a problem to oral surgeons. Fortunately, in the majority of instances, such conditions respond satisfactorily to conservative methods of therapy. Occasionally, however, the commonly accepted methods fail, and it becomes necessary to search for other ways to treat this condition.

A review of the literature reveals a scarcity of information concerning adequate surgical treatment of chronic dislocations. An exception is the comprehensive and valuable article published by Myrhaug[1] in 1951. The literature pertaining to this subject will be reviewed, and a case managed by the surgical approach advocated by Myrhaug will be reported.

The differentiation between the terms "subluxation" and "dislocation" is rather ill defined. *Blakiston's New Gould Medical Dictionary*[2] refers to subluxation as "incomplete dislocation." Dislocation is defined as "the displacement of one or more bones of a joint or of any organ from the original position." Actually the dental and medical professions when referring to the temporomandibular joint have accepted a subluxation as the displacement of the condyle out of the fossa and past the articular eminence which is self-reducing. Dislocation is considered to be a displacement of the condyle past the articular eminence which must be reduced manually. It is believed that in the second condition, pain stimuli produce a spasm or contraction of the muscles of mastication, which tend to elevate the condyles and lock them in a position anterior to the eminence. Dislocations or subluxations are usually bilateral but may be unilateral.

■ *Etiology*

It is the general impression that any act or force which imparts undue tension on the capsular ligament may produce permanent stretching of the supporting ligaments with a resultant hypermobility of the condyles. Among the chief offenders are prolonged dental appointments, especially the difficult removal of molar teeth, otolaryngological procedures where the mouth gag is overextended, and improper use of the laryngoscope or bronchoscope. Occasionally the jaw has been dislocated purposely to afford greater access to the pharynx and larynx. Once a

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1. Myrhaug, Hilmar. New method of operation for habitual dislocation of the mandible—review of former methods of treatment. Acta odont. scandinav. 9:246 Sept. 1951.

2. Hoerr, N. L., and Osol, Arthur, editors. Blakiston's new Gould medical dictionary, ed. 2. New York, Blakiston Division, McGraw-Hill Book Co., Inc., 1956.

loose capsule exists, the act of yawning is the foremost offender in producing a dislocation. In addition to mechanical factors affecting the capsule, it has been postulated that a deficiency may exist in the connective tissue, reducing its tensile strength. This deficiency is considered to be possibly associated with vitamin C deficiency.

Myrhaug[1] stated that the glenoid fossa is much deeper in present-day, highly civilized races than in earlier, more primitive peoples and that the articular eminence tends to be high, steep and narrow in modern man. He also observed that a deep overbite is associated frequently with the deep, contracted fossa and the steep, high and narrow articular eminence, and he felt that this type of joint predisposes to habitual subluxation. Observations do not entirely confirm this belief, as some of the conditions which have proved most resistant to treatment have been those in patients with prognathic mandibles and shallow fossae.

■ *Treatment*

The treatment of chronic dislocation may be divided into immediate and definitive. Immediate or emergency treatment becomes necessary when the dislocation cannot be reduced by the patient. In such instances it is often possible to achieve relaxation and to break up the pain stimuli with the parenteral use of meperidine hydrochloride or morphine. The condyles then may be manipulated into the fossae. On some occasions, however, sufficient relaxation is not achieved in this fashion, and a general anesthetic must be administered to permit successful reduction of the dislocation.

Among the definitive measures which have been advocated are the following: (1) immobilization of the jaw combined with large doses of ascorbic acid;[1, 3-13] (2) use of prosthetic restraining appliances;[14] (3) the introduction of a sclerosing agent into the joint cavities[3, 4] and (4) various surgical procedures.[1, 6, 10, 12, 13]

It is the general opinion of those who have had extensive experience in treating temporomandibular joint disorders that prolonged immobilization of the mandible, with or without the use of vitamin C, has failed to achieve any permanent beneficial correction of a loosened or stretched joint capsule.

Any of the various types of prosthesis which tend to restrain or restrict the opening of the mandible may serve rather well as a temporary measure. Unfortunately the problem of hypermobility still exists on the removal of the appliance, and some

3. Schultz, L. W. Report of ten years' experience in treating hypermobility of the temporomandibular joints. J. Oral Surg. 5:202 July 1947.

4. McKelvey, L. E. Sclerosing solution in the treatment of chronic subluxation of the temporomandibular joint. J. Oral Surg. 8:225 July 1950.

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7. Müller, G. M. Long-standing dislocation of mandible; manual reduction. Brit. M. J. 1:572 April 13, 1946.

8. Schwartz, M. Unreduced unilateral dislocation of jaw; operative correction after 4 years. J. Bone & Joint Surg. 22:176 Jan. 1940.

9. Watanabe, Yoshio; Igaku-Hokushi, and Otake, Masatoshi. Unreduced dislocation of the mandibular joint following eclampsia: report of a surgically treated case. Oral Surg., Oral Med. & Oral Path. 3:1010 Aug. 1950.

10. Fardeau, Andre. New technique for surgical treatment of recurring luxation of the mandible. (Digest) D.D.S. 1:37 Dec. 1952.

11. Kochar, Edward. Treatment of subluxation of the temporomandibular joint. Pennsylvania D. J. 51:12 June 1948.

12. Sussman, B. A. Correction of bilateral subluxation of the temporomandibular joint. New York D. J. 14:522 Nov. 1948.

13. Morris, J. H. Chronic recurring temporomaxillary subluxation; surgical consideration of "snapping jaw" with report of successful operative result. Surg., Gynec. & Obst. 50:483 Feb. 1930.

14. Zahnarst, Ernst. Prosthetic treatment of habitual luxation and sub-luxation. (Abst.) D. Cosmos 57:1305, 1915.

more permanent therapy is ultimately necessary.

Schultz[3] must be given the credit for calling attention, in 1937, to the use of sclerosing agents in the joint spaces. His work was based on extensive and scientific animal experimentation, and in the succeeding years such therapy has proved by its clinical effectiveness to be the method of choice for the treatment of temporomandibular joint hypermobility. Five per cent sodium psylliate (Sylnasol) is considered the agent of choice, as it produces no undesirable side effects and yet causes the formation of a dense fibrous capsule when injected into the joint space. McKelvey[4] thoroughly reviewed the technic of administration of the sclerosing agent as well as other phases of diagnosis and treatment. The idea of attempting to produce fibrosis by the injection of an irritating substance into the joint space is not a new one. Myrhaug[1] stated that in 1884 von Hacker injected a solution of alcohol into the temporomandibular joint space. In 1889 tincture of iodine was injected by Genzmer.[1]

It is fortunate that in the majority of instances hypermobility and its complications may be treated successfully by comparatively conservative methods. Occasionally, however, surgery becomes the final resort after the failure of other methods. Among the conditions necessitating surgical treatment is the dislocation of long standing. Gottlieb[5] mentioned 16 instances of unreduced dislocation of the mandible, varying in duration from 33 days to four and one-half months. One instance of six years' duration which originally occurred during a tonsillectomy was reported. Gottlieb stated that he had found reports in the literature of only three such instances, two of two months' duration and one of three months' duration, which could be reduced manually. Since the condyles become fixed in malposition by fibrous adhesions and connective tissue fills the fossae, surgical treatment which usually consists of resection of the condyles must be resorted to in such instances.

Through the years, a variety of surgical procedures, which have met with varying degrees of success, have been advocated for the correction of chronic dislocation. From the scarcity of available information, and from the fact that no standard surgical procedure has yet been generally accepted, it appears that there is need for a surgical technic which promises a consistent record of success.

Some of the technics previously reported are:

1. Removal of a portion of the joint capsule and suturing of the cut edges in an attempt to shorten the loose fibers.[1]

2. Turning down a flap of temporal fascia and suturing it into the capsule in an effort to strengthen it and restrict the motion of the condyle.[1, 6, 13] Nieden[15] reported success with this procedure in 1924.

3. Separating the anterior portion of the disk from the capsule and suturing it to the periosteum covering the anterior periphery of the fossa or the posterior portion of the articular eminence.[6]

4. Separating the disk from its anterior attachment to the capsular wall. A portion of the fibers of the external ptery-

15. Nieden, H. Habitual dislocation of jaw. Deutsch Zschr. Chir. 183:358, 1924.

goid muscle is then separated from the condyle, and the disk is displaced forward on the articular head and fixed with sutures when it is in a vertical position.[13]

5. Removal of the articular disk with the purpose of deepening the fossa. The severance of the attachment of the external pterygoid muscle to the condyle has been advocated in conjunction with the removal of the disk.[1,3-6]

6. Removal of the meniscus and drilling holes in the condyloid process and base of the zygomatic arch. A strip of fascia lata is passed through these holes, tied and sutured. Four cases which have been successfully treated in this manner have been reported.[1]

7. Passing wire or tendon through holes in the coronoid process and base of the zygomatic process and tying them, in an attempt to restrict the opening of the mandible.[1,3-6]

8. Attempting to graft a piece of bone to the articular eminence in order to create a barrier to the forward movement of the condyle.[1]

9. Chiseling off a portion of the articular eminence, turning it down and allowing it to heal in this position to afford a restriction to the movement of the condyle.[1]

10. Complete removal of the condyle.[1]

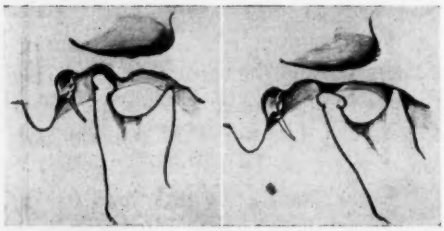

Fig. 1—Left: Condyle in its normal relationship to articular eminence when mandible is at rest. Right: Articular eminence is blacked out, illustrating how removal of this tubercle may make it impossible for condyle to dislocate

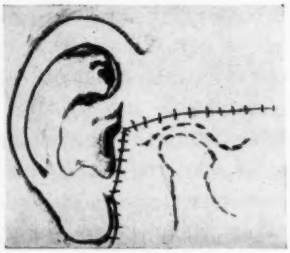

Fig. 2—Incision recommended by Myrhaug for approach to articular eminence

As has been stated by Myrhaug,[1] all these procedures were designed to restrict the forward movement of the condyle. It remained for Myrhaug to approach this problem from an entirely different viewpoint. Instead of attempting to restrict the forward movement of the head of the condyloid process, he advocated the removal of the articular eminence in order that the head might move back into the fossae without restriction after opening the mouth (Fig. 1). The meniscus is left intact.

The incision which Myrhaug advocated for this exposure consists of a modified preauricular approach. It begins in the fold anterior to and opposite the tip of the lobe of the ear and extends superiorly to a point opposite the base of the tragus of the ear. From this point it swings forward at almost right angles over the base of the zygomatic process, thus affording good access to the eminence through a rather small exposure (Fig. 2). The anterior portion of the capsule is split

and the articular eminence shaved off with chisels without disturbing the meniscus or its attachment to the external pterygoid muscle. Myrhaug reported success with this procedure. It should be noted that the eminence can also be reached satisfactorily through a vertical preauricular incision.

A case which was unresponsive to conservative therapy is reported. The technic described by Myrhaug was employed.

■ *Report of Case*

The patient, a 20 year old member of the Women's Army Corps, was first seen by the dental service for a routine dental check in the spring of 1956. Examination revealed several carious teeth and a mild periodontal condition which was believed to be due to very poor occlusal relationship associated with a rather severe prognathism. The carious teeth were restored, and periodontal treatment, which included occlusal equilibration, was initiated. The periodontist noted considerable hypermobility of the temporomandibular joints, but there was no history of dislocation. Several months later she was first seen by the oral surgery section for reduction of a dislocation of the mandible which occurred during the act of yawning. This was rather easily reduced, but dislocations occurred on each of the two succeeding days.

EXAMINATION—Examination revealed a well-developed young woman with no physical complaint other than the dislocations of the temporomandibular joints. These joints were now rather tender to palpation. As previously described, there was a rather severe prognathism with poor occlusal relationship including an open bite.

Clinical observation disclosed considerable hypermobility of the temporomandibular joints. Roentgenograms of the joints taken in the open and closed positions revealed rather shallow glenoid fossae and an excessive range of motion of the condyles.

COURSE OF TREATMENT—Because it was believed that the prognathism and resultant poor occlusal relationship might be a contributing factor to the hypermobility of the joints, the possibility of a surgical correction of the prognathic condition was explored thoroughly. It was determined that the occlusal relationship after surgery would still be very poor; therefore, this possibility was rejected. One half cubic centimeter of sclerosing solution (Sylnasol) was then injected into each joint space, and the mandible was immobilized for 18 days. This was followed by another injection of 0.5 cc. in each joint space and eight additional days of immobilization. Approximately six days after removal of the elastic traction, another series of dislocations began which became progressively more difficult to reduce.

The injection of sclerosing solution was again carried out following the technic previously described. This was approximately one month after the patient was released from the previous treatments. On removal of intermaxillary elastics three days elapsed before another series of dislocations began. The majority of these occurred when the patient yawned in her sleep.

It was decided to attempt again to

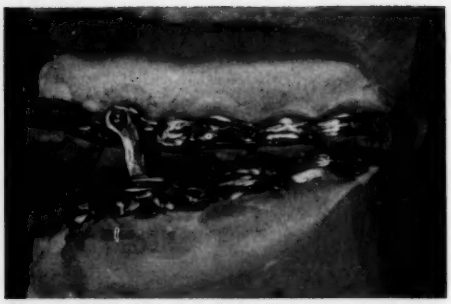

Fig. 3—Cast labial splints with restraining devices

control these dislocations by a third series of injections, which were given approximately six weeks after the second series. Again, on removal of intermaxillary elastics, dislocations, which became increasingly more difficult to reduce, occurred at more frequent intervals. Within slightly under four months, 34 dislocations of the mandible had occurred which had to be reduced manually, either with heavy sedation or under general anesthesia. Thus it was evident that the generally effective method of sclerosing the joint capsule was a failure in this instance.

Maxillary and mandibular labial splints were then constructed. Attached to the labial surface of these splints in the first molar regions was a limiting device which allowed the mandible to open approximately 1 cm. in this region and yet prevented a dislocation of the condyles (Fig. 3).

The patient continued her duties for approximately one month with the appliances in place. At this time the limiting devices were removed and a check for mobility conducted. This examination revealed no improvement in the tendency to dislocate.

The patient was scheduled for surgery, and the technic of removing the articular eminences, as previously described, was carried out. After surgery, the splints with limiting devices were left in place for two weeks and then removed.

Five months have now expired since the removal of the articular eminences. There has been no tendency to dislocate during any movements of the mandible, and the patient has experienced no discomfort or occlusal changes.

■ MEASUREMENT OF SCIENTIFIC ACCOMPLISHMENTS

In fact, it would seem that only those who had some first-hand experience in the acquisition of new knowledge in some disciplined field would be able truly to appreciate how great the science of the past has been, and would be able to measure those giant accomplishments against their own efforts to penetrate a few millimeters further into the darkness that surrounds them.—*J. R. Oppenheimer.*

Removal of teeth from irradiated tissue

■ *Harold H. Niebel,* D.D.S.; Edward W. Neenan,† D.D.S., Chicago; Robert P. Walsh,‡ D.D.S., Bronx, N. Y., and John B. Weimer,§ D.D.S., West Haven, Conn.*

The removal of teeth from heavily irradiated bone, after radiation therapy for malignancies, is a problem which occasionally confronts the oral surgeon. The development of pulpal hyperemia, necrosis, or later formation of radiation caries, may compel the oral surgeon to remove these teeth, even though the procedure is hazardous.

Since irradiated tissues have a decreased blood supply and lowered vitality, extraction must be performed with a minimum of trauma. Introduction of infection into the irradiated tissues must be avoided. The technic hereafter outlined, which has been used successfully by the authors and others,[1,2] is presented in an effort to focus more attention on what has proved to be a fairly simple and successful method of treating a difficult problem.

The effects of irradiation on bone and soft tissues have been found to be essentially the same throughout the body.[3] The mandible and maxilla, however, are particularly susceptible to these effects because of their high calcium content with resultant increased back-scatter irradiation. Irradiation greatly reduces the vitality and growth of bone cells and the bone-forming functions, and interferes with normal nutrition. The actual breaking down of the bone seldom begins until infection is introduced, although the changes within the bone have already taken place.

In instances of radio-osteonecrosis, the exposed bone, although still vital, will not react as does normal bone. Regeneration fails to take place because of irradiation action on osteoblasts and interference with the nutrient supply. Histologic examination reveals either a decrease or an absence of osteoblasts. The walls of the blood vessels are thickened with reduction in both the size of the lumen and the blood flow.

If the bone becomes exposed, infection may penetrate into and around the bone, separating the highly sensitized periosteum from the bone surface. This periosteum, with its damaged blood supply, will not regenerate and re-cover the affected bone.[4] As a result, when infection attacks the irradiated bone, the decreased regenerating and healing powers enhance the development of radio-osteonecrosis.

*Chief, inpatient dental service, Veterans Administration West Side Hospital.

†Director, dental services, Veterans Administration West Side Hospital.

‡Veterans Administration Hospital.

§Chief, dental service, Veterans Administration Hospital.

1. Birch, C. L., and Snider, F. F. Tooth extraction in hemophilia. J.A.D.A. 26:1933 Dec. 1939.

2. Dalitsch, W. W. Removal of teeth by exfoliation with elastic ligatures. D. Digest 43:310 Aug. 1939.

3. McLennan, W. D. Some observations on mandibular radionecrosis. D. Record 72:380 March 1953.

4. Daland, E. M. Radiation necrosis of the jaw. Radiology 52:205 Feb. 1949.

To prevent this process, concern should not be limited to infected nonvital or carious teeth. Damage is also experienced by apparently normal teeth remaining in the mouth. A peculiar type of dental caries usually follows radiation therapy. A considerable decrease in the pH of the saliva has been reported. This increased acidity is attributed to lessened glandular function, lessened masticatory function due to pain or insufficient number of teeth, and increased organisms due to poorer oral hygiene.[5] There is a decrease in quantity of saliva which reduces the natural mechanical cleansing action in the mouth and contributes to radiation caries. Gingivitis often accompanies irradiation decay, causing hemorrhaging and denuding of the tooth root. This allows infection to facilitate the production of radio-osteonecrosis.

The morbidity period of radio-osteonecrosis may extend from one to eight years. Although all remaining teeth in the mouth, nonirradiated as well as irradiated, may suffer these pathogenic changes, the lower teeth appear to be more susceptible.

Since the etiology of radio-osteonecrosis is attributed to intensive roentgen-ray therapy, trauma to the structures in the region and the induction of infection into the jaw from the oral flora,[5] the post-irradiation extraction is a hazardous procedure. For these reasons, serious thought should be given to the removal of all teeth when heavy irradiation is contemplated.

There seems to be no great difference of opinion regarding the removal of carious, infected and nonvital teeth prior to roentgenotherapy. Most authorities also believe that any teeth, either good or bad, which are in the field of radiation should be removed. Some feel that an edentulous mouth is the only mouth to be treated by roentgen rays except where limited lesions can be treated through small portals, and adequate protection is possible.

Daland[4] stated that teeth and radiation therapy are not compatible. Whenever high-voltage roentgen-ray therapy is to be directed to lesions of the mouth, any teeth through which the beam will pass should be removed before treatment is started. Teeth, no matter how healthy, come out before treatment and not after. There are no exceptions.

It is Burket's[6] opinion that if large portals of treatment are used in a patient with a prospect of long survival, all teeth should be removed prior to radiation, thus keeping the possibility of future infection to a minimum. For small lesions, only teeth in the irradiated area and one on each side should be removed if the patient refuses complete extraction. In Burket's experience, dental extractions are never a safe procedure after intensive irradiation, and radio-osteonecrosis may come on spontaneously at any time after high-voltage roentgenotherapy.

With the advent of antibiotics there has been some tendency toward conservatism. Wildermuth and Cantril[7] stated that when radiation is applied to a mandible rendered edentulous immediately prior to treatment, the resultant delayed reconstruction creates a greater possibility of mucosal puncture and subsequent infection than the presence of carious ir-

5. LaDow, C. S. Osteoradionecrosis of the jaw. Oral Surg., Oral Med. & Oral Path. 3:582 May 1950.

6. Burket, L. W. Oral medicine: diagnosis and treatment, ed. 2. Philadelphia, J. B. Lippincott Co., 1952, p. 509.

7. Wildermuth, O., and Cantril, S. T. Radiation necrosis of the mandible. Radiology 61:771 Nov. 1953.

radiated teeth. In their opinion the teeth can be extracted safely when they become troublesome at a later date, and the mandible will heal with the aid of meticulous care and intensive antibiotic treatment.

■ *Technic*

The following technic is a safe and effective method of extraction although it is not new and has been used previously for the removal of teeth from hemophiliac patients.[1,2] The occlusal surface of the tooth indicated for removal is ground out of occlusion (if an occluding tooth is present). An elastic band, similar to orthodontic or fracture bands, is slipped over the crown and carried to the gingival crest. If the tooth is multirooted or lacks sufficient apical taper, several bands may be used (Fig. 1). In some instances it may be necessary to work manually the first band under the free gingiva. Although root canal therapy and sectioning of multirooted teeth may be accomplished first, it has not always been necessary.

The mouth must be kept scrupulously clean during the entire procedure of removing the teeth. A thorough prophylaxis should be given before the initiation of treatment. The patient is instructed to use a soft bristle toothbrush to maintain good oral hygiene.

It is not unusual for the patient to experience some discomfort the first day after application of the elastic bands, but this quickly subsides and the tooth remains asymptomatic. Examination of the tooth or teeth should be conducted biweekly and additional elastic bands added as needed. Although the process is primarily one of bone resorption, a certain amount of extrusion takes place (Fig. 2).

Fig. 1—Elastic bands in position for extrusion of upper left molar

Additional occlusal grinding may become necessary. Sensitivity of exposed dentin is controlled with silver nitrate applications. At no time is the irradiated bone directly exposed to the fluids of the mouth. Between 3 and 16 weeks are required to remove a tooth by this method. The length of time depends on the following factors: (1) number and position of tooth roots; (2) the degree of apical force exerted by the elastic bands and (3) the condition of the supporting alveolar bone.

In order to understand more clearly the histological changes occurring during this procedure, a laboratory experiment was undertaken using adult male albino rats. Small elastic bands constructed from rubber dam material were obtained and placed over the rats' upper right second molars. The operation was performed under pentobarbital anesthesia administered intraperitoneally. The second molar on the opposite side of the jaw of each animal served as a control. Daily observation and determination of the degree of mobility of the teeth were made. Additional elastic bands were added as necessary.

Fig. 2—Osteoclastic action induced by pressure of elastic bands

When the tooth was sufficiently loose, the animal was sacrificed, and both tooth and surrounding supporting tissues were cut for histological study (Fig. 3).

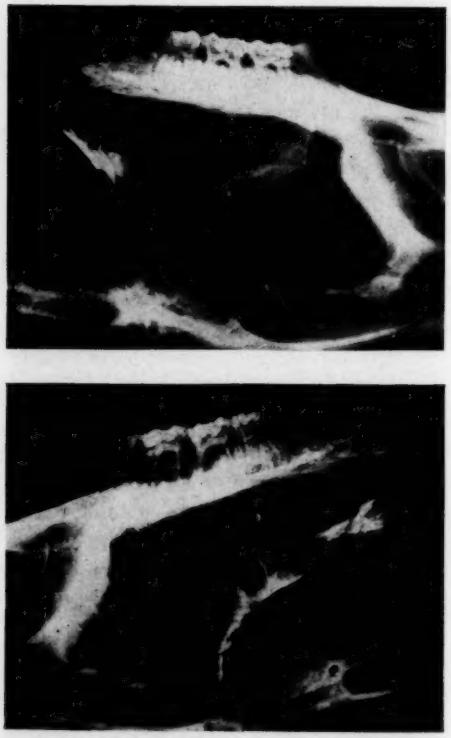

Fig. 3—Experimental alveolar resorption in jaw of rat

Microscopic examination revealed the presence of numerous osteoclasts (Fig. 4). Granulation tissue had filled the periodontal space and the areas of bone resorption. The pressure of the bands had induced very slight inflammatory reaction (Fig. 5). There was a moderate amount of polymorphonuclear leukocytic infiltration and evidence of bone repair. The buccal and lingual plates of bone showed some compensatory osteophytic bone apposition. This was immature bone and was the reaction to alveolar bone loss. The marrow was fibrous in the new bone region.

Although it is acknowledged that oral bacteria can penetrate the periodontal space and supporting tissues by this procedure, it is felt that the trauma induced and production of a portal of entry are minimal. This method of removing teeth can be considered less hazardous in these irradiated tissues.

■ *Report of Cases*

CASE 1— A 34 year old, well-developed man was admitted to the hospital September 29, 1950, for treatment of a painful indurated ulcer beneath the tongue on the right side. The lesion extended from the midline to the alveolar ridge laterally and at least to the anterior tonsillar pillar posteriorly. There were

palpable lymph nodes present in the neck. Tissue from the lesion had been removed for biopsy two weeks previously and was reported as epidermoid carcinoma grade 3. The patient had lost about eight pounds and was only able to take soft foods. His temperature ranged around 100°. Physiological observations were essentially negative except for occasional paroxysmal tachycardia with rates up to 170 and some difficulty in breathing.

Roentgenotherapy was started on October 5. After 1,300 r were delivered to each side of the face and neck, the lesion decreased approximately 50 per cent in size. Roentgenotherapy was continued up to a total of 6,000 r over a period of 29 days. A section removed for biopsy on November 15 was positive for epidermoid carcinoma. A biopsy specimen taken December 14 was reported negative. Sections removed on December 28, 1950, and January 8, 1951, were reported negative, and the tumor had disappeared completely. The patient was seen February 15, and since there was no clinical evidence of tumor and since three successive negative biopsy specimens had been obtained, the patient was discharged to be followed at monthly intervals for evidence of recurrence.

On April 3, 1952, the patient entered the Bronx Veterans Administration Hospital for removal of the lower right second bicuspid. Since he had been subjected to heavy irradiation in this region, the decision was made to remove the tooth by the rubber band technic. The occlusal surface of the tooth was ground down, and the first band was placed around the neck of the tooth. Six additional bands were placed around the tooth between April 7 and May 6. The tooth was extruded May 6. Postoperative roentgenograms were taken June 2, and the patient was discharged with no complications.

On November 18, he again entered the dental clinic, complaining of pain in the lower right first molar region. Since the removal of the bicuspid had been accomplished with no complications, the rubber band method was again selected for removing this tooth. The crown was

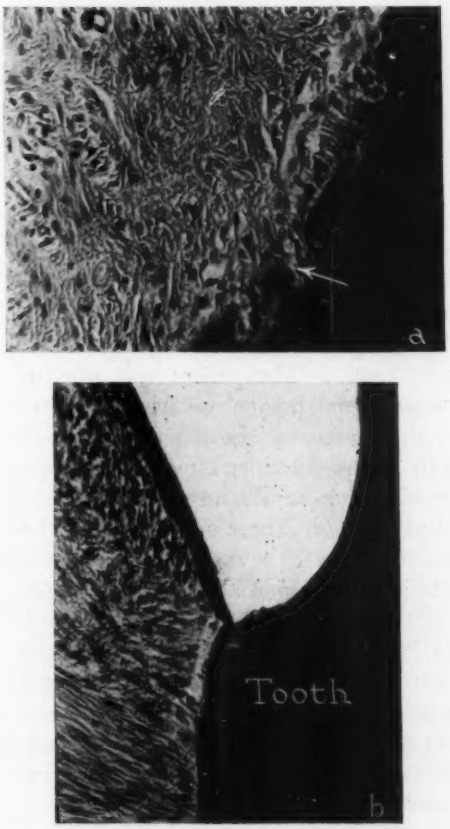

Fig. 4—a: osteoclasts in Howship's lacunae; b: gingival attachment before placement of bands

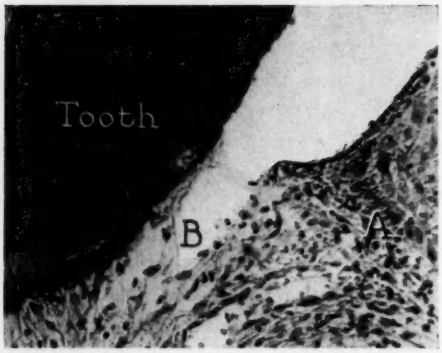

Fig. 5—A, slight inflammatory reaction induced by pressure of elastics; B, note soft tissues detached

reduced and the first band applied November 18. Between that date and March 17, 1953, 13 bands were applied. The patient failed to return for further treatment until May 30, at which time he reported that the tooth had extruded spontaneously from the socket. Postoperative check on June 17 failed to disclose any complications, and the case was closed.

CASE 2—The patient was admitted to a general hospital on May 21, 1945, with a tumor of the left parotid gland. His history dated back two months prior to admission, at which time he had noted swelling in the cheek and part of the left ear. On May 28 as much of the tumor as possible was removed, but it was impossible to remove the entire tumor because of its invasive characteristics and extension into the deep structure of the masseter muscle. Pathological diagnosis was adenocarcinoma of the parotid gland with elements of mixed parotid tumor contained therein.

Tissue was removed for biopsy August 10. The examination showed moderately differentiated adenocarcinoma of the parotid gland. Complete dissection of the tumor then was attempted, and it was dissected away from the masseter muscle to which it was adherent. After the operation the patient received roentgenotherapy from August 29 to October 3, a total of 23 roentgen-ray treatments totaling 6,900 r to the left preauricular region.

The patient entered the Bronx Veterans Administration Hospital dental clinic on April 22 complaining of pain and discomfort in the region of the lower left second and third molar. Since he had received over 6,900 r to the mandible, it was decided to remove both teeth by the rubber band method. The roots of the third molar were divided, and two bands were placed. Two bands were also placed on the second molar at this sitting. Between that date and May 16, five additional bands were placed over the distal root of the lower third molar at which time the root extruded from its socket. On May 26 after six bands had been placed, the mesial root was extruded. On May 29 after seven bands had been placed, the lower second molar was extruded. Follow-up roentgenograms on June 3 failed to disclose any complications, and the case was closed.

On November 12 the patient reported to the dental clinic for removal of the upper left first molar. Again the rubber band method was used. The tooth was ground out of occlusion and two bands were placed on this date. This tooth spontaneously extruded itself from the socket March 20, 1953. Postoperative follow-ups to May 26 revealed no complications, and the case was closed.

■ *Summary*

1. Extraction of teeth after irradiation for oral cancer presents a problem to the oral surgeon because of radiation tissue changes. These changes result in improper healing after oral surgical procedures.

2. It is generally felt that the removal of any teeth in the field of radiation regardless of their condition is desirable. In those instances where limited lesions can be treated through small portals and adequate shielding is possible, extraction of teeth may be avoided.

3. The removal of teeth with the use of elastic bands has been used previously in hemophiliac patients and is the technic of choice for extraction in irradiated areas.

4. Although this procedure is primarily one of bone resorption, a certain amount of extrusion does take place.

5. The usual length of time required for removal of a tooth by this method varies from 3 to 16 weeks.

6. Histologic studies demonstrate that granulation tissue fills the periodontal space and the area of bone resorption so that at no time is supporting alveolar bone exposed. It is felt that the trauma and production of a portal of entry for bacteria are kept to a minimum with the use of this method for removal of teeth from irradiated tissues.

■ MODESTY IN ACCOMPLISHMENT

In April 1922, six months before Halsted's death and thirty-seven years after the discovery of nerve-blocking, Halsted was tendered a public banquet by the American National Dental Association and presented with a gold medal. He was much touched by this spontaneous and generous, though belated, tribute. He wrote to a friend: "The celebration was a success. I am so thankful to have lived to take part in it. Not a wink of sleep did I get during the night of Saturday. I was too exhilarated for repose. Once before in my life I was kept awake by a great happiness; this was the night that I passed successfully the examination for Bellevue Hospital, in 1876." What an interesting, frank, almost naive letter for a man of seventy, already a member of a great many learned societies and an acknowledged world-renowned master, who was so pleased by the tribute to a discovery he made when a young man of thirty-three!

Halsted, after making this remarkable discovery, made no attempt to capitalize on it or to "get himself before the public," as many lesser surgical lights succeed so well in doing. There were too many unsolved surgical problems he was too busy with.—*Major.*

A variation in cleft palate

■ *J. R. Hayward,* D.D.S., M.S., and J. K. Avery,† D.D.S., Ph.D., Ann Arbor, Mich.*

With the lack of complete knowledge and the gross complexity of cleft palate etiology, all workers in the field are alert for even slight plausible evidence. For this reason the rather unusual manifestation of cleft palate included in this report may contribute to knowledge of "how" if not "why" the deformity appears.

The genetic basis for cleft lip and cleft palate has advanced beyond the theoretical stage with the increasing support of thorough and large-scale investigations in recent years. With a hereditary tendency known to be present in approximately 30 per cent of most studies, there still must be other determining factors in order to bring about the cleft anomaly. The great variation in recessive and dominant genetic patterns defies the establishment of a predictable basis for the appearance of oral clefts. The genetic tendency has been interpreted as the lack of potential for mesodermal proliferation across fusion lines after the borders have been approximated. The fairly common clinical finding of atrophic epithelial bands spanning clefts and the occult variations of clefts with absence of muscular development are often cited in support of this explanation.

Environmental factors still would appear to contribute to the actual precipitation of the failure in the closure of the parts of the lip and palate. The investigations with animal studies have consistently directed attention to nutritional deficiency as a significant cause of oral clefts. These results have been influenced in part by the susceptibility of the strain of animals used. Transposition of the maternal malnutrition theory to explain oral clefts in human beings has not brought supporting correlation.

The critical time of fusion of the parts of the lip and palate is known to be vulnerable to environmental influence. Animal studies with the administration of radiation energy, steroids and fetal hypoxia have been reported to produce oral cleft anomalies. The question of impaired circulation in the areas of fusion with alteration in vascular blood supply at the critical time of union of the parts also has received support among theories for cleft formation.

Mechanical obstruction which prevents the approximation of the margins of component parts has been cited intermittently over the years as a contributing factor in the production of clefts. The possible role of tongue position in relation to cleft palate production will be clarified by a review of embryology later in this report. Some asynchronous phases in de-

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velopment may retain the tongue in the nasal area between the palate parts. Fetal positions may cause upward pressure on the mandible and keep the tongue in a superior obstructing position.

The sporadic appearance of isolated cleft palate which Fogh-Andersen[1] and others have found to be less dependent on genetic predisposition may lend some credence to the mechanical influence of tongue position in this variety of the deformity. The Pierre Robin syndrome of mandibular micrognathia, glossoptosis and cleft palate also suggests mechanical influences on fetal jaw and tongue structures. Rosenthal[2] reported a case of isolated cleft palate associated with a congenital tumor of the tongue in 1935. Blair and Ivy[3] describe a specimen in the Hunterian Museum in London showing adherence of the tongue to the anterior end of a cleft palate by a band of tissue. The case report which follows illustrates another instance where there is apparent association of tongue position and the cleft palate anomaly.

■ *Report of Case*

An infant was admitted to University Hospital on October 1 because of feeding difficulties which were due to congenital anomalies of cleft palate and an anomalous membrane in the mouth. Birth was normal after a full-term pregnancy which was essentially normal.

Physical examination at the time of admission revealed a 6 pound 2¼ ounce white boy who had an incomplete cleft of the palate which extended through two thirds of the hard palate and the entire soft palate area. The cleft was extremely wide, measuring 2 cm. at the point of maximum width at the junction of the hard and soft palates. The most unusual feature of this deformity centered around a band of tissue which originated superiorly from the margin of the cleft palate, from the anterior pole of the cleft along both the hard palate area and over 0.5 cm. of the soft palate zone. The band extended downward as a curtain of mucous membrane which was adherent to the floor of the mouth on the left side (Fig. 1, left). The attachment extended inferiorly from the midline, where it was continuous with the lingual frenum along the surface of the floor of the mouth, above the location of the submaxillary duct, over a distance of 3 cm. The band had elevated the floor of the mouth and produced deviation of the tongue toward the opposite side. The band of tissue which joined the floor of the mouth to the margin of the cleft palate on the left had

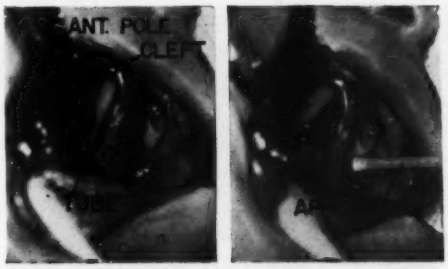

Fig. 1—Left: Clinical view of band extending from cleft palate margin to floor of mouth. Right: Band anomaly with applicator placed behind posterior margin

1. Fogh-Andersen, Poul. Inheritance of harelip and cleft palate. Copenhagen, Arnold Busck, 1942.
2. Rosenthal, Wolfgang. Pathologie und Therapie der Fötalen Gesichts und Kieferspalten. Deut. Zahn Mund Kieferhk. 2:513 Sept. 1935.
3. Blair, V. P., and Ivy, R. H. Essentials of oral surgery, ed. 4. St. Louis, C. V. Mosby Co., 1951.

a definite posterior border (Fig. 1, right). The soft palate component on the left side could be deviated either to the medial or lateral aspect of the curtain. The soft palate was approximately 1 cm. longer on the left side than the similar palatal component on the right side. The submaxillary duct on the right side appeared to be enlarged and apparently imperforate at the orifice of the duct in the region of the caruncle.

This infant was a third generation of cleft palate abnormality. The mother, aged 25, was in good health. The father, aged 32, had a cleft palate and a minimal cleft lip which was repaired by surgery. The father's brother also had a cleft palate. The fraternal grandfather was also afflicted by an incomplete cleft of the palate. No other known congenital anomalies were reported in the family history.

Laboratory examination on the day of admission revealed no significant abnormalities of the urine. The red blood cell count was 6,800,000; hemoglobin was 17.2 Gm. The white blood cell count was 9,400, with normal differential.

Roentgenographic examinations of the chest and the abdomen were negative.

The baby was gavage fed, using an indwelling polyethylene tube, which he tolerated quite well, taking 1½ ounces every four hours.

On October 4, it was felt that the child could tolerate surgical intervention, and, accordingly, on this day, release of the abnormal band of tissue between the cleft of the palate and the floor of the mouth was carried out as a preliminary procedure under endotracheal ether anesthesia.

The patient tolerated the procedure very well and seemed to have an uneventful postoperative course. Forty-eight hours after surgery, however, it was apparent that the child was having some respiratory difficulty. His color was slightly dusky, and respirations were labored. At approximately 2:00 o'clock in the afternoon the cyanosis became more severe, and respirations became irregular and jerky. Examination of the chest disclosed scattered fine, moist rales throughout both lung fields. It was felt that the child might have aspirated some foreign material, and, accordingly, suction was used vigorously. Laryngoscopy was performed, and a small quantity of formula was obtained which was apparently pooled in the posterior pharynx. Despite vigorous measures to relieve the apparent obstruction to respiration, the child died at approximately 3:55 in the afternoon.

Autopsy permission was granted, and examination of the lungs indicated bilateral aspiration pneumonia with abscesses. Death was by asphyxia. Also, bilateral adrenal hemorrhage was noted secondary to anoxia. There was left pleural effusion. These pulmonary complications developed in spite of postoperative use of oxygen continuously in the incubator (Croupette), preventive penicillin, and close nursing and staff observation.

The biopsy report of the band of tissue removed stated that the tissue was covered by a slight cornifying squamous cell epithelium. In the interior there were cysts lined by similar epithelium. There were a few mucous gland alveoli and a ductlike structure with columnar epithelium. A slight amount of fibrous stroma was present.

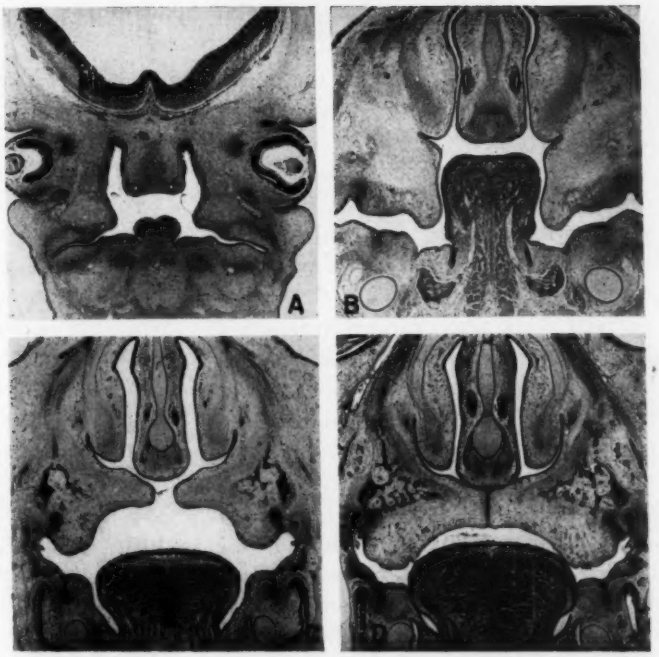

Fig. 2—Stages in development of structures of oral cavity at sixth, seventh, eighth and tenth week shown in coronal (perpendicular to sagittal) plane sections. Note relation of palatine shelves to tongue and floor of mouth

■ *Theories of Etiology of the Malformation*

It is of interest to recall the normal development of the palate and to analyze embryologically when and how the defect may have occurred. In this manner it may be possible to determine whether the defect is a result of the cleft palate, a correlated abnormality, or a contributing factor in cleft palate etiology.

Early in the sixth week of prenatal life, the anlage of the tongue appears as three swellings, one central and two lateral tubercles (Fig. 2, A). The lateral lingual swellings of the tongue enlarge rapidly during the seventh week because of the growth and differentiation of its voluntary muscle. The enlarging tongue is limited from lateral expansion by the developing jaws. It thus grows vertically, filling the stomodeal cavity. Meanwhile the lateral palatine shelves expand medially to divide the stomodeal cavity into the nasal and oral cavities. As they move, they contact the lateral edges of the tongue which causes them to bend downward, and with further growth they occupy the space lateral to the tongue in the floor of the mouth (Fig. 2, B).

During the eighth week the rapid growth and expansion of the tongue decreases as the musculature differentiates. At the same time the face broadens and lengthens, creating space in the floor of the mouth into which the tongue recedes (Fig. 2, C). With the tongue no longer in the nasal cavity, the lateral palatine

shelves are able to direct themselves medially and horizontally to make contact at the midline, separating the overlying nasal cavity from the oral cavity (Fig. 2, D).

The anomalous band of tissue in the reported case was attached superiorly to the margin of the cleft and inferiorly to the floor of the mouth. This abnormality would have occurred during the eighth prenatal week when the proportionately large tongue normally causes the palatine shelves to project downward into the floor of the mouth. In the present case the epithelium of the palatine shelf and floor of the mouth probably contacted each other at that time and became fused. The vertical dimension of the face then increased with continued normal growth. But because of the restricting attachment of the tissue band, there resulted an elevation in the position of the floor of the mouth and a deviation of the tongue.

Subtelny[4] found in 32 per cent of all unilateral cleft palates as well as those clefts involving only the soft and hard palate that the palatal shelves were inclined toward the floor of the mouth.

■ *Discussion*

The case reported offers a clear illustration of the intricate interrelationships of the developing oral structures. The only time the palatine shelves are in contact or near contact with the floor of the mouth is during the short period of one week before the tongue recedes to the floor of the mouth. Fusion of the two epithelial surfaces could cause a cleft palate condition by preventing the tongue from receding normally with or without displacement of palatine shelves. In view of the hereditary history of cleft palate in this instance, it is more probable that there was an abnormal positioning of the structures involved or an alteration in the timing of tongue recession and palatal closure. It is thus probable that in this particular instance the malformation was a result of the cleft palate condition and was only an associated anomaly brought about by the structural proximity of developing parts.

4. Subtelny, J. D. Width of the nasopharynx and related anatomic structures in normal and unoperated cleft palate children. Am. J. Orthodont. 41:889 Dec. 1955.

■ Education

Let us be honest with youth and tell them that there is no one magic formula of education for war or peace, no fruit of the tree of knowledge which, swiftly eaten, can make one wise as gods; there is nothing absolutely good and nothing absolutely evil. Even in these critical days, when educated persons are so desperately needed, the process of education requires time and work and striving.—*Virginia C. Gildersleeve. Many a Good Crusade.*

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CASE REPORTS

Multiple osteomas of the mandible: *report of case*

■ *Noah R. Calhoun,* D.D.S., M.S.D.; Stanley Jackson,† D.D.S., and Milton C. Wright,‡ D.D.S., Tuskegee, Ala.*

On September 30, 1955, a negro man, age 25 years, entered the Veterans Administration Hospital, Tuskegee, Ala., with an admission diagnosis of deformity of the mandible. The patient's chief complaints were: (1) soreness of the jaw and right foot; (2) a change in the pitch of his voice, and (3) difficulty in swallowing. He related that periodic soreness and the deformity of the mandible began in 1946, two months after initial treatment of a fracture of the mandible. The change in his voice first had been noticed in 1952 and the dysphagia had been manifested several months prior to the date of admission.

PAST HISTORY—The patient stated that his jaw had been broken by a blow from a rifle butt in 1946. He was not aware of the exact site of the fracture of the mandible but did recall that it had been treated with intermaxillary wiring. About two months after the original injury, he had noticed a gradually increasing swelling in the region of the angles of the mandible. The swellings had been slightly tender and associated with slight, persistent pain but subsided in approximately two weeks. Shortly thereafter he had noted several hard, irregular enlargements at each angle of the mandible. The enlargements had grown slowly but progressively larger. After four months, the patient had been transferred to the U. S. Naval Hospital, Philadelphia, where he remained seven months for further treatment of the fractured mandible.

In June 1950, the patient had been admitted to the Veterans Administration Hospital, Tuskegee, Ala., for treatment of bronchial asthma and deformities of the mandible. A review of the hospital records revealed that, in investigation of the deformities of the mandible, blood studies, urinalysis and roentgenographic examination of the skull, pelvis, vertebrae, and extremities had been made.

The roentgenographic examination of the skull and mandible had showed circumscribed areas of decreased density in the calvarium and large, sharply circumscribed areas of increased density overlying the angles of the mandible.

A slight decalcification had been observed in the body of the third lumbar vertebra and the transverse process of the fourth lumbar vertebra. The roentgenographic impressions had been Paget's disease of bone (osteitis deformans) or sclerosing tumors of the submaxillary gland.

The blood calcium, phosphorus and phosphatase determinations had been within normal limits. The urine calcium was 3+ (Sulkowitch). The patient had received no definite

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treatment of the deformities of the mandible. He had been discharged July 31, 1950, with a diagnosis of bronchial asthma and calcified hematomas of the angles of the mandible. The patient had been advised to have regular progress examination of the masses of the mandible in the future.

On July 23, 1954, the patient had been admitted to the Veterans Administration Hospital, Birmingham, Ala., for treatment of the deformities of the mandible and bronchial asthma. The records of that institution revealed that, in connection with the deformities of the mandible, the patient had received the following diagnostic investigations and treatment: urinalysis, blood (calcium, phosphorus and phosphatase) determinations, roentgenographic examination of the skull, mandible, extremities and pelvis; and removal of tissue from the mass of the left angle of the mandible for biopsy. The roentgenographic findings had been essentially the same as those seen in 1950. The blood and urine studies had been within normal limits.

The biopsy report had recorded a diagnosis of fibrous dysplasia of the mandible. The microscopic description had not been given. The patient had been discharged from that hospital on August 9, 1954, with a diagnosis of polyostotic fibrous dysplasia, Albright's syndrome.

CLINICAL EXAMINATION—The chin was slightly protruded. Palpation revealed hard, lobulated, fixed masses bilaterally along the angles and posterior border of the ascending rami of the mandible. The masses extended medial and posterior to the mandible. The mass on the left side was larger than the one on the right. The overlying soft tissues were freely movable. The left middle submaxillary lymph nodes were enlarged, nontender and freely movable. The thyroid gland was not enlarged. The patient's voice was high in pitch and harsh. Intraoral examination was nonrevealing.

PROVISIONAL DIAGNOSES—Provisional diagnoses were as follows: (1) osteomas of the angles and rami of the mandible; (2) fibrous dysplasia involving the mandible; (3) excessive callus formation from an old fracture of the mandible, and (4) Paget's disease of bone involving the mandible.

ROENTGENOGRAPHIC EXAMINATION—Roentgenograms were taken of the teeth, the skull, the mandible, the vertebrae, the pelvis and long bones. The roentgenographic examination revealed that the upper left deciduous cuspid, first and second molars and the upper right first deciduous molar were retained. The alveolar process showed scattered irregular areas of increased and decreased density. Large, dense bony excrescences were seen along the posterior and medial aspects of the mandible (illustration, above, and below left). Scattered areas of decreased density were seen within the body of the mandible and the maxillas. The skull (illustration, below right) showed circumscribed areas of increased and decreased density. There were no obvious abnormal bone changes in the vertebrae, pelvis and extremities.

LABORATORY EXAMINATION — Repeated urine calcium, blood calcium, phosphorus and phosphatase determinations were all within normal limits.

BIOPSY REPORT—On October 11, 1955, under local anesthesia using 2 per cent lidocaine hydrochloride with epinephrine, a specimen of bone was removed intraorally from one of the radiolucent areas in the right molar region.

Gross examination revealed that the specimen consisted of three fragments of bony tissue which varied in size from 4 mm. to 5 mm. They were irregular in shape and were covered by dark brown soft tissues.

Microscopic examination of the section of bone and soft tissue showed areas suggestive of condensation of the bone lamellas and focal areas of trophic degeneration. The changes were not appreciable and were not consistent with the clinical diagnosis of fibrous dysplasia. The changes were suggestive of osteodystrophy, the cause of which was not evident in the sections.

HOSPITAL COURSE AND TREATMENT—Between September 30 and November 1, 1955, consultation was obtained from the departments of oral surgery and oral medicine of the University of Alabama, and the surgical and medical services of our hospital. On the basis of the dysphagia and the lack of a definite diagnosis, the consensus was that the larger of the masses should be removed and submitted for microscopic study.

On October 10, an unsuccessful attempt was made to inject lipiodol into the submaxillary glands.

OPERATION—On November 4, the patient was premedicated with atropine sulfate, morphine sulfate and pentobarbital sodium. The calcified mass of the left side of the mandible and two submaxillary lymph nodes were removed under endotracheal anesthesia using

Preoperative views. Above and below left: Note excrescences along angles and rami of mandible and circumscribed areas of decreased density in body of right side of mandible. Below right: View of skull showing areas of decreased density in calvarium

thiopental sodium, and nitrous oxide and oxygen.

An extraoral incision was made starting at a point approximately 1 cm. below the tip of the left mastoid process and extending approximately 2 cm. below the inferior border of the mandible to the left mental foramen region. The incision was deepened by blunt dissection to the inferior border of the mandible. During the procedure two enlarged lymph nodes which were detected in the submaxillary triangle were removed. The overlying soft tissue was then reflected, and the masseter and internal pterygoid muscles were detached from the lateral and medial surfaces of the ramus and angle of the mandible exposing the bony mass. The masses were removed with a bone saw and chisels. The remaining irregular bone was smoothed with files. A rubber drain was placed so that it extended from the medial surface of the ramus through the incision. The incision was closed in layers, and a dressing was applied. The lymph nodes, a piece of periosteum and the excised bone were submitted for microscopic study.

The patient recovered without complications, and the skin sutures were removed on the fourth postoperative day.

Postoperative roentgenograms confirmed the fact that the calcified mass of the left side of the mandible had been removed.

PATHOLOGY REPORT—The gross examination revealed that the specimen consisted of several masses of bone and three pieces of soft tissue. The bony masses varied in diameter from 7 mm. to 3.5 cm. They were grayish white color, of marble hardness and planoconvex in shape. The soft tissue varied in size from 0.8 cm. to 1.5 cm. They were ovoid in shape, grayish brown in color and grossly resembled lymph nodes.

The microscopic examination revealed that sections of the bony masses showed dense trabeculae of mature bone which had curvilinear markings and contained varying sizes of central blood vessels. Only small amounts of fibrous stroma and acellular necrotic tissue were noted between the bony trabeculae. There were no histologic changes consistent with a diagnosis of fibrous dysplasia. The sections of lymph node showed reactive changes consistent with chronic lymphadenitis.

The microscopic diagnoses were (1) multiple osteomas of the mandible and (2) chronic lymphadenitis.

FINAL DIAGNOSIS—The final diagnosis was multiple exostoses (osteomas) of the mandible.

COMMENTS—The history of the fractured mandible indicated a possible osteomyelitis of the mandible during 1946. An unsuccessful attempt was made to secure the patient's previous hospital records relating to the fracture of the mandible. It is conceivable that the calcified masses of the mandible were the result of trauma to the region.

Four years after the fracture of the mandible some of the roentgenographic findings in the mandible, maxillae and alveolar process seemed to have been consistent with the findings in fibrous dysplasia or Paget's disease of bone. The urine calcium, blood phosphorus and phosphatase determinations, however, were within normal limits during several periods of hospitalization.

In consideration of the patient's dysphagia the larger of the masses was removed. The microscopic findings of the calcified masses were not consistent with a diagnosis of either Paget's disease of bone or fibrous dysplasia. On the basis of the history, laboratory reports, clinical examination and microscopic findings, final diagnosis was multiple exostoses (osteomas) of the mandible.

Hypertrophy of the masseter muscles and mandible: *report of case*

■ *Jack B. Caldwell,* D.D.S., M.Sc., and Kenneth W. Hughes,† D.D.S., San Francisco*

Hypertrophy of the masseter muscles and the mandible is uncommon. In 1880 Legg[1] reported the case of a ten year old girl with bilateral enlargement of the masseter and temporal muscles of three weeks' duration. Coffey,[2] in 1942, reported a 19 year old youth with what Coffey had thought was a tumor of the right jaw. At the time of surgery, however, he had discovered that the mass was greatly hypertrophied masseter muscle.

Gurney[3] apparently was the first to treat masseter muscle hypertrophy surgically for cosmetic reasons. In 1947 he stripped off the outer muscle fibers to reduce prominence. Adams[4] reported a case of masseter muscle hypertrophy in 1949 in which he surgically resected a portion of the muscle from its medial aspect.

In 1951 Maxwell and Waggoner[5] reported three cases of unilateral and one case of bilateral hypertrophy of the masseter muscle. Tempest[6] also reported one case the same year. In 1954 Soderberg,[7] Kern[8] and Drummond and McIntosh[9] reported one case each. Soderberg excised the prominent gonial angles of the mandible in addition to resecting the medial aspects of the masseter muscles bilaterally, to achieve a good cosmetic result. In 1955, Masters and co-workers[10] reported six cases in which the condition was treated surgically.

Hypertrophy of the masseter muscles may be more common than reports of it in the literature would indicate. This may be because its occurrence is of little clinical importance except in differential diagnosis and in instances where there is an indication, for cosmetic reasons, for its surgical correction.

It is not particularly uncommon to observe moderate overdevelopment of one side of the mandible or to see enlarged masseter muscles bilaterally. When hypertrophy progresses to a considerable degree, however, there is often considerable interest exhibited by clinicians and even doubt in the minds of experts as to the diagnosis. Diagnosis is based on history, absence of trismus, pain or tenderness and absence of a demonstrable mass when the muscle is relaxed. It is also significant to find, on palpation of the contracted muscle, hard cord-like immovable muscle bundles bulging under a freely movable overlying skin.

The etiology of this clinical entity is obscure. Unilateral hypertrophy may be caused by temporomandibular joint dysfunction, defective dentition resulting in abnormal masticating habits, and the nervous habit of bruxism, or habitual clenching of the jaws.

The following case illustrates the occurrence of bilateral hypertrophy of the masseter muscles and mandible.

*Colonel, Dental Corps, U.S. Army. Chief, oral surgery section, Letterman Army Hospital.

†Lieutenant Colonel, Dental Corps, U.S. Army. Resident, oral surgery section, Letterman Army Hospital.

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Fig. 1—Left: Full face view showing prominence of soft tissue over angles of mandible. Right: Right side of face. Note prominent muscle bundles of right masseter muscle

REPORT OF CASE—A 26 year old white soldier was referred to Letterman Army Hospital on December 16, 1954, for evaluation of bilateral enlargement of the mandible, together with what appeared to be a soft tissue mass in the region of the insertion of the right masseter muscle (Fig. 1, left).

HISTORY—A facial asymmetry had first been noted eight years previously, on a high school graduation photograph. As a high school student, the patient had made a practice of "chewing gum all day long." He had also developed a habit of clenching the teeth when under mental stress. After graduation of the patient from high school, the degree of facial asymmetry had gradually increased. During 1948, intermittent "aching and sharp shooting pain" occurred about the right side of the face. Infrequent recurrences of these symptoms caused minor discomfort. No history of trauma or disease was associated with the condition. The patient had remained relatively well during the period of symptoms, and there had been no weight loss or other constitutional disturbance. Family history as available was noncontributory.

EXAMINATION—When first seen in December 1954, the patient appeared to be in no significant distress. Physical examination revealed spondylolisthesis and bilateral enlargement of the angles of the mandible and masseter muscles. A nontender, diffuse, soft mass was found in the area of the right masseter muscle. When the teeth were clenched, the right masseter muscle stood out prominently, with three distinct muscle bundles in evidence (Fig. 1, right). The mass appeared to involve the masseter muscle. Intraoral examination revealed excessive occlusal abrasion for a patient of this age group.

Laboratory studies including hematology, blood chemistry, urinalysis and serology were negative or within normal limits.

Roentgenographic examination of the mandible and facial bones revealed pronounced enlargement of the mandibular rami bilaterally but no evidence of abnormal trabecular pattern or bony disease (Fig. 2).

Roentgenographic examination of the spine revealed an anomalous deformity of the fifth lumbar vertebrae with posterior wedging and decrease of anteroposterior diameter, together with an associated neural arch defect. Roentgenograms of the chest were negative.

OPERATION—On December 16, 1954, a biopsy of the soft tissue mass in the region of the right masseter muscle was accomplished under

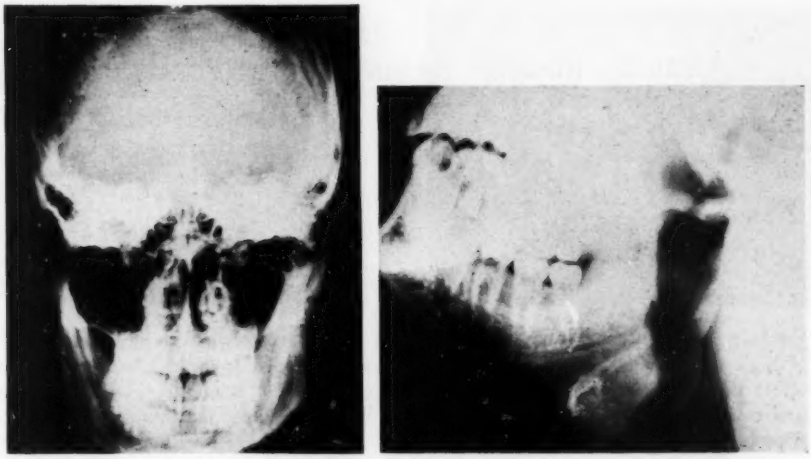

Fig. 2—Left: Posteroanterior view showing pronounced enlargement of mandibular rami. Right: Lateral jaw view showing enlargement of gonial angles

local anesthesia, through a skin incision in the right cheek. Clinically, the mass appeared to consist of muscle. A representative specimen was removed and submitted for histologic examination. Normal healing occurred after the surgical procedure. The sutures were removed on the seventh postoperative day.

PATHOLOGY REPORT—Report of histological examination of the tissue specimen indicated that the soft tissue enlargement consisted of hypertrophied striated muscle.

COMMENT—This case is reported as an interesting problem in differential diagnosis. Clinically the patient had what appeared to be a soft tissue mass about the angle of the right ramus of the mandible. Various examiners considered the mass as representative of lipoma, "pleorphic adenoma" of the parotid gland, blockage of the parotid gland or duct, aberrant parotid gland tissue, an angiomatous lesion, or hypertrophy of the right masseter muscle. Although the history, clinical findings and roentgenographic investigations were considered adequate to confirm the diagnosis of benign hypertrophy, histologic examination of a representative tissue specimen was believed necessary in this instance to convince the patient of the correctness of the diagnosis.

Treatment of benign hypertrophy of the masseter muscle consists of corrective measures to establish a habit of bilateral mastication, exercises of contralateral underdeveloped atrophied musculature or surgical correction of the deformity by excision of a section of the hypertrophied musculature.[2]

SUMMARY—An uncommon benign enlargement of the facial musculature is reported. Benign muscle hypertrophy should be considered in the differential diagnosis of any apparent facial enlargement or mass in the region of the masseter muscles.

Unusual luxation of mandibular condyle: *report of case*

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With the increase in automobile accidents because of high speed, and the high percentage of survivors due to the tremendous advances in general care of patients, many difficult and unusual problems arise.

An instance of a luxated and fractured mandible which presented some unusual problems to the oral surgeon will be described here.

HISTORY—A 16 year old boy was transferred to our hospital after one week's hospitalization elsewhere for multiple injuries sustained in an automobile accident. The patient had been under observation for cerebral damage, and multiple lacerations of the face and head had been closed. One attempt at reduction of a luxation of the left mandibular condyle had been unsuccessful. No further treatment had been given because of the patient's general condition.

PHYSICAL EXAMINATION—The patient was a well developed, well nourished boy who spoke with difficulty and was somewhat lethargic and uncooperative. Blood pressure was 126/74, pulse 64, respiration 12, and temperature 98.6°F.

Roentgenograms revealed an anterior luxation of the left mandibular condyle (Fig. 1) and a midline fracture of the mandible with the left side considerably displaced and the right side nearly in occlusion. There was some subconjunctival hemorrhage in the right eye, coarse pulmonary rales, and a fracture of the right shoulder.

The remaining physical examination was essentially negative.

TREATMENT—A few intermaxillary wires were placed to immobilize partially and to stabilize the mandible. Two days later, the boy's condition had improved sufficiently to allow a general anesthetic to be administered, and several attempts at reducing the dislocation were unsuccessful. Several fractured and painful anterior teeth were removed, and a more satisfactory intermaxillary wiring was inserted.

Five days later, under general anesthesia, a second attempt was made to relocate the mandibular condyle. The condyle was movable in its position, but could not be reduced. A condylectomy was planned.

Exposure of the left condyle revealed that it had been forced out of the glenoid fossa and was situated superior and medial to the zygomatic arch, lateral to the temporal bone, and immediately anterior to the zygomatic process of the temporal bone. Neither the zygoma, temporal bone nor the condyle was fractured.

The condyle would move, but could not be brought downward from this position as the mediolateral dimension was greater than the available space, and the soft tissue structure prevented its movement forward and downward.

Access was gained by removal of the zygomatic arch. The neck of the condyloid process was then sectioned and the condyle removed. The zygomatic arch was replaced and fixed

From the department of oral surgery, Indiana University Medical Center.

Fig. 1—Preoperative view. Left lateral projection

Fig. 2—Postoperative view. Left lateral projection

with transosseous wires. The fractured mandible was then partially reducible and rubber band traction was applied.

Four days later the occlusion was good, and roentgenographic studies revealed a satisfactorily reduced mandible (Fig. 2).

Ten days after the condylectomy, supportive therapy was discontinued, the patient's mental condition was good, and he was discharged from the hospital.

After the removal of the appliances, the patient was able to open his mouth approximately 1 cm. but refused to cooperate in his exercises so that in one year he could only open it 0.5 cm.

He was admitted to the hospital with a diagnosis of fibrosis of the left temporomandibular region. With the patient under nitrous oxide, oxygen, succinylcholine chloride anesthesia, the mandible was forced open. Supporting chin straps were placed and strict exercises begun.

Two weeks later, on discharge, the patient was able to open his mouth approximately 3.4 cm. with ease.

No further complications developed.

SUMMARY—A 16 year old boy had a fractured mandible and the left condyle had been driven into the temporal fossa. Repeated attempts at reduction were unsuccessful, and a condylectomy was performed. Removal of the zygomatic arch was necessary in order to gain access to the condyle.

One year later, function was poor so the fibrous regions were relieved by forceful opening of the mandible. Satisfactory results were obtained.

■ EXPERIENCE

The only complete catastrophe is the catastrophe from which we learn nothing.—*William Ernest Hocking. Experiment in Education.*

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The American Society of Oral Surgeons

THERE IS GREAT NEED for expansion of the executive organization of the American Society of Oral Surgeons, if the Society is to be an effective factor in the future development of the specialty of oral surgery.

The American Society of Oral Surgeons, organized in 1918, was built by and for a small number of men. For many years, it was not large enough numerically to permit the employment of even a part-time executive officer. Indeed, by 1952, after 34 years of existence, the Society had but 494 members. During the following four years, however, —1953 through 1956—the membership increased 58 per cent to a total of 781.

This recent rapid growth is almost a direct reflection of the greater emphasis which has been placed on formal training in oral surgery since World War II. The number of training services is still increasing, and therefore it can be safely assumed that the rather sharp upward trend will be maintained in the foreseeable future. At this time it would seem within the realm of probability that total membership will reach 1,000 in the next two or three years.

Obviously an organization that was developed originally for the benefit of a small number of members cannot continue to function for that purpose indefinitely and at the same time devote its energies and facilities to the solution of the many problems that face oral surgery today.

The increase in quality of graduate training in oral surgery presages a bright future for the specialty of oral surgery, provided it is represented by a vital and imaginative central organization. If on the other hand the central organization is not effective, the future of oral surgery is most certainly clouded and obscure, for many forces are actively working against this specialty of dentistry at the present time. The majority of the members of the American Society of Oral Surgeons are anxious to be represented by a more active organization. And since such an organization should be the major source of protection of their professional future, they are willing to support it financially if the leadership and organization are vital, democratic and imaginative.

It is our fond hope that the membership will see the importance of growing organizationally as well as numerically and that it will take early action to set up a full-time executive office in Chicago where the personnel can work effectively and in close liaison with the officials of the American Dental Association, the American Hospital Association, the American Medical Association and the Joint Commission on Hospital Accreditation, all of whom have their central offices in that area.

Many of the problems facing oral surgery today are based on lack of understanding on the part of medicine. It can be safely assumed that the creation of closer working relations between oral surgery and medicine on the national executive level eventually will promote better working relations between members of the specialty of oral surgery and members of the other groups in the health field.

The time has come when oral surgery must step forward and become a truly effective force in the field of health service. To do so demands reorganization of the American Society of Oral Surgeons at the earliest possible moment. Failure to do so will inevitably produce gradual deterioration of the Society as an active force in dentistry and as an important segment of the nation's health service.—*Fred A. Henny.*

■ Scaley Condition of Lower Lip

Q.—What is the significance of a persistent scaley condition of the vermilion surface of the lower lip?

A.—This alteration is seen most frequently in individuals who spend considerable time out of doors and are exposed unduly to the sun. It is known as actinic cheilitis and must be considered a precancerous lesion. If it does not respond promptly to application of lubricants, biopsy specimens should be taken of the most suspicious regions. Lesions that are detected early are treated most successfully by warning the patient to screen the face from the sun and to apply an ointment for filtering ultraviolet rays to the vermilion surface of the lower lip several times daily when he is out of doors. Advanced conditions that fail to respond to conservative therapy should be treated by excision of the involved portion of the mucous membrane and by advancement of a flap of normal mucous membrane from elsewhere on the lip.

■ Removal of Impacted Third Molars

Q.—What is the best method for the removal of impacted lower third molars that have not as yet developed roots?

A.—Removal of teeth of this type is frequently indicated for orthodontic reasons. If usual methods are employed, their removal is difficult since they ordinarily refuse to be elevated in their crypts and instead roll in the crypt when elevator force is applied. In such circumstances, the crown of the developing tooth should be exposed in the usual fashion, but no attempt should be made to elevate it. Instead, it should be sectioned from the buccal to the lingual aspects and, if necessary, from the mesial to the distal. The sections then can be removed with ease and without trauma. Sectioning is accomplished best with a no. 8 round, tungsten carbide bur, under water-spray irrigation. This allows rapid atraumatic sectioning of the tooth.

■ Unexplained Sinus Tract

Q.—A patient who sustained fractures of the maxilla and mandible a year ago is now under treatment for construction of a partial denture. Healing of the jaw fractures appears to be completely satisfactory. Two lower bicuspids which were near a fracture line in the mandible were devitalized by the trauma and were treated by root canal fillings six months ago. Although the root canals appear satisfactory and there is no roentgenographic evidence of bone destruction in the region, a small sinus tract is present over the region of the bicuspid apexes. There is a scant amount of purulent drainage from this sinus with little inflammation. The bicuspids are important to the design of a satisfactory partial denture. Should they be removed? Are there other explanations for the sinus tract?

A.—Latent mucosal sinus tracts in regions of fractures of the jaws may be encountered where lacerations have healed with irregularity. Sometimes a small sequestrum of cortical bone may be devitalized by the fracture and may initiate a chronic course of low grade suppurative reaction and drainage. It is assumed that the status of other teeth in this region has been determined to be satisfactory. Surgical exploration of the sinus tract is indicated.

This section devoted to queries and comments from readers on topics of current interest to oral surgeons and general dental practitioners is edited by James R. Hayward, University Hospital, Ann Arbor, to whom readers are invited to send their communications. The answers, prepared by competent consultants, do not necessarily represent the opinions of any official scientific organization. Your participation in this section is invited.

The Editor

■ Postoperative Hematoma

Q.—If a patient who has had an impacted third molar removed returns at a 48 hour postoperative visit with a definite, large hematoma beneath the mucoperiosteal flap, what treatment is required?

A.—The location and relative size of the hematoma require variations in the management of this complication. By 48 hours, the clot is completely formed, and organization has begun at the periphery. Healing will progress with absorption and organization of the hematoma. Needle aspiration or drainage of the central liquefied region of the hematoma is sometimes advised. It must be remembered that these regions are vulnerable to infection, and precautions to intercept infection complications are important; adequate anti-infective agents should be used. Time is certainly the most helpful element when this complication arises. The patient may be prepared for regional ecchymosis of overlying skin and slow regression of the firm swelling.

■ Antibiotics in Combination

Q.—Some antibiotics are now being prepared in combination form. Is there any advantage to prescribing antibiotics in this combination form as opposed to prescribing them individually?

A.—These new combination forms of antibiotics should in no way be construed as "shotgun" therapy. It has been shown *in vitro* that a synergistic action does occur, especially against resistant staphylococci. However, there is some question at present as to whether the same action occurs *in vivo*. Some authorities feel that it does occur. Others maintain that a definite balance is necessary between the antibiotic concentration and the concentration of the infective organisms. This balance is not always present clinically. Therefore, there may not be an effective synergistic action. When any infective process is not responding to antibiotic treatment, sensitivity tests of the organism to various antibiotic drugs should be made.

■ Antagonists for Ultra-Short-Acting Barbiturates

Q.—Is there any specific antagonist to the ultra-short-acting barbiturates?

A.—At the present time, there is no specific antagonist to the ultra-short-acting barbiturates. Signs and symptoms of barbiturate toxicity are manifested by changes in the cardiovascular and nervous system, and treatment is directed at overcoming respiratory depression and shock. The best treatment is oxygen under positive pressure and artificial respiration. Respiratory stimulants or analeptic drugs such as pentylenetetrazole (Metrazol) and picrotoxin may be of some value. However, there are recent reports on two new drugs being used clinically, with varied results, on an experimental basis. These drugs are Megemide and methyl-phenidylacetate hydrochloride (Ritalin). It is not definitely known whether these drugs are true antagonists or have an analeptic action.

■ Opaque Sinus Mass with Oroantral Fistula

Q.—On discovery of a draining sinus on the crest of an edentulous maxillary ridge, the diagnosis of oroantral fistula was considered. Various roentgenographic projections indicate a defect in the antral floor and the presence of a radiopaque, well circumscribed mass 1.5 cm. in diameter within the maxillary sinus. The teeth in this region were extracted over a year ago, and a new denture was constructed one month after the extractions. The opaque mass does not have the appearance of calcified tooth structure. What may be the nature of this mass?

A.—This foreign body may be impression material forced through a defect in the sinus floor when impressions were taken for the complete denture prosthesis. Many impression pastes have zinc oxide as their base, which appears opaque in roentgenograms. Other foreign bodies and possible bone sequestrum may also be considered. The exact nature of the material must await exploration and recovery.

■ A depressed fracture of the malar bone should be suspected in persons with facial injuries who have a flatness of the side of the face or who have a restriction of the opening motion of the mandible. The restriction of motion is caused by mechanical interference due to the contact of the depressed malar fragment with the coronoid process of the mandible.

■ Gravity may be used as an aid in the diagnosis of angioma of the oral region. The patient who is suspected of having such a lesion should be asked while sitting to bend over and to place his head between his legs so that filling may take place. Upon returning to a normal sitting position, the lesion will be distended. Venous filling is more rapid and more pronounced than that observed in lymphangiomas.

■ A sharp, burning sensation experienced by a patient who is being given an intravenous injection should indicate to the operator that the needle has been placed incorrectly. Most commonly, this is an indication that the injection has been made intraarterially or interstitially. In such an event, the needle should be withdrawn immediately, and a new site should be selected for the venipuncture. A subcutaneous injection of 1 or 2 cc. of a local anesthetic agent should be infiltrated in this region to offset the resultant pain.

■ Inflammatory lesions of the oral mucous membrane, such as those seen in erythema multiforme, may be aggravated and prolonged by local treatment that is too vigorously administered. Local therapy should be simple and supportive and designed only to increase the patient's comfort. Secondary infection that may be present is managed most safely by systemic administration of the indicated antibiotic. Oxidizing mouthwashes and topically applied antibiotics are to be avoided, especially since many patients develop allergic responses to them and have a subsequent increase and persistence of local symptoms.

■ The absence of sugar in the urine does not necessarily preclude the possibility of diabetes. In some instances, the blood sugar level may be elevated above normal but sugar may not spill into the urine. Therefore, in patients under clinical suspicion because of either the history or clinical observations, it is good to make a fasting blood sugar test to ascertain definitely that the blood sugar level is within normal limits.

■ Radiopaque, rounded shadows appearing in the floor of the mouth or in the neck on routine roentgenographic studies do not necessarily indicate salivary duct calculi. Instead, they may represent the presence of a phlebolith (calculus) occurring in one of the numerous veins in this region. When such lesions are noted, it is necessary to make a differential diagnosis. In the absence of symptoms of the salivary glands, the presence of a phlebolith must be suspected. Final diagnosis usually can be established by obtaining stereoscopic views of the region, combined with a clinical history and possibly with probing of the duct of the gland most closely associated with the foreign body. Occasionally, it may be necessary to make sialograms to localize the shadow under suspicion definitely.

Readers are invited to send their clinical observations to the editor, Fred A. Henny, Henry Ford Hospital, Detroit.

■ MANDIBULAR PRESERVATION IN RADICAL CANCER SURGERY. G. B. O'Connor, M.D.; M. W. McGregor, M.D., and S. Saffier, M.D. Plast. & Reconstr. Surg. 18:185 Sept. 1956.

Oncologists agree that wide cancer removal, preferably en bloc, is a prime requisite of cancer surgery. However, in certain select and isolated instances of carcinoma of the floor of the mouth, radical cancer surgery can be accomplished, and yet a segment of the mandible can be retained in the symphysis menti region. This procedure eliminates the cancer and is the major step forward in rehabilitating these patients. Retention of the bony symphysis where possible is important, because its loss materially interferes with normal mouth function and utterly deforms the lower facial segment. It is superior to the insertion of any foreign body such as wires, pins, plates or an immediate bone graft. A case is reported in which this technic was carried out with an acceptable and agreeable end result. The surgical approach for the operation in this region is described in detail—*Myron Kaufman.*

■ MACROGLOSSIA OR GIANT TONGUE. James W. Hendrick, M.D. Surgery 39:674 April 1956.

Macroglossia or giant tongue is an unusual clinical entity. Several diseases produce macroglossia in varying degrees, among which are lymphangioma, hemangioma, congenital muscular hypertrophy, primary and secondary amyloidosis, myxedema, acromegalia and glycogenosis.

Hemangiomas and lymphangiomas of the head and neck within the oral cavity are not rare. These developmental anomalies are produced from the endothelial rudiments of the blood and lymph vessels; they are congenital in origin and as a rule are observed shortly after birth. When they are large and appear in the tongue, the term macroglossia or giant tongue is applied. The tongue attains great size and after a period of months or years fills the mouth and interferes with eating, swallowing and talking.

An instance of macroglossia produced by congenital lymphadenoma is reported. A one-stage partial glossectomy was used to correct the condition.—*Irwin A. Small.*

■ AUTOPLASTIC REPAIR OF THE RAMUS MANDIBULAE, AVOIDING A LESION OF THE FACIAL NERVE AND OF LARGE BLOOD VESSELS. A. Rehrmann, M.D., Dr.med.dent., Plast. & Reconstr. Surgery 17:452 June 1956.

An osteoplastic repair of the ramus should be considered after exarticulation of the mandible in treatment of benign or malignant tumors. Such repair is usually late, since an immediate repair is risky if the oral mucosa has to be opened. In instances of malignancy, it is wise to wait several years after the original resection.

The appearance of the patient after exarticulation is characteristic. The soft tissues—skin, muscle, parotid gland—have lost their bony support and are displaced medially into the glenoid fossa. Thus the parotid gland with the included facial nerve and the external carotid artery are situated further beneath the glenoid fossa than originally, as are also the internal maxillary and superficial temporal arteries.

The position of these structures makes injury to the nerve and vessels more difficult to avoid in preparation of the bed for the bone graft. A full thickness bone graft from the iliac crest is inserted into the glenoid fossa. This procedure prevents deviation of the mandible and atrophy of the implanted bone by providing support to the bone graft at the base of the skull and functional stress to the graft by this contact.

A curved incision is made in the submandibular region, exposing the tendon of the digastric muscle. The lateral surface of the stylohyoid muscle is followed up to the styloid process into the glenoid fossa; contact is kept with the bone surface; blunt scissors are used for dis-

section. Then a broad, rounded elevator is used to push the soft tissues laterally into the proper position, a procedure which empties the fossa and extends the wound channel for the bone graft. Thus the disfiguring concavity of the cheek immediately disappears. Two cases are presented which illustrate this procedure.—*Vernon J. Sture.*

A Surgical Technique for the Correction of Alveolar Collapse in Cleft Palate Patients. W. M. Adams. Plast. & Reconstr. Surg. 17:430 June 1956.

A technic is described which was used on seven patients who had complete cleft lip and palate. The clefts were accompanied by extreme underdevelopment of the maxillae and considerable collapse of the dental arch. Osteotomes are used to produce a complete horizontal fracture of the maxillae bilaterally at the pyriform angle as well as a vertical fracture through the site of the original cleft of the hard palate. This procedure permits a shift of the right and left maxillae laterally to any desired position. The procedure is indicated on all patients who fail to show improvement after more conservative methods of treatment for alveolar collapse have been used.

Prior to surgery, the orthodontist takes impressions and makes study models of the teeth. The upper model is sectioned and repositioned for proper occlusion. From this model, a self-retaining orthodontic splint is made to fit the repositioned segments of the upper arch which will occlude with the lower arch. Metal orthodontic bands are then placed on the upper molars for the attachment of the appliance at the time of surgery.

The splint is worn for several months during which time the orthodontist may carry out other corrective measures for improving the position of individual teeth. The patient is then referred to a prosthodontist for construction of a permanent prosthesis to replace any missing teeth, to maintain the proper position of the maxillae, to provide fullness and more normal contour to the upper lip and to close over any cleft of the hard palate.—*Vernon J. Sture.*

■ Late Results in the Treatment of Prognathism by Double Condylectomy. Mario Gonzalez-Ulloa, M.D. Plast. & Reconstr. Surg. 18:50 July 1956.

In a group of ten patients who were operated on for the correction of prognathism of varying degree, double condylectomy is reported to have been satisfactory for all. Five years have elapsed since the patients were operated on. The purpose of the present paper is to report the result of the operation after five years and to disclose the present functional, esthetic and physiological condition of the individuals.

The resection of the condyle was performed through an incision which gave sufficient exposure of the temporomandibular articulation without endangering any of the important elements of this region. The determination of the condylar fragment to be sectioned in order to obtain the desired correction became a simple procedure when double focal-point roentgenography (center of condyle and interincisive line) was used. The fragment to be excised was marked out and sectioned with a specially designed chisel applied to a dental impactor.

After the operation, the opening of the mouth decreased a minimum amount. The lateral movements were normal. The muscular strength of the mandible was not affected by the operation. It is felt that the operation fulfills its purpose without gross complication.—*Myron Kaufman.*

Dental Extraction in Haemophilia and Christmas Disease. John A. Orr and A. S. Douglas. Brit.M.J. No. 5026:1035 May 4, 1957.

Most hemophiliacs are reluctant to seek dental attention. The fear of dental extraction is, of course, well justified; unfortunately, this dread of the dentist prevents the proper care of the teeth by conservative methods, and as a consequence the teeth are commonly neglected. The authors report their experiences in the management of dental extractions in patients with hemophilia or the closely allied condition,

Christmas disease. Thirty-two dental operations, involving the removal of 57 teeth, were carried out on ten patients, nine of whom were hemophiliacs and one of whom had Christmas disease, lacking the Christmas factor. The number of dental operations performed on each patient varied from one to seven.

For each patient a protective dental splint was prepared before the operation and inserted immediately after removal of the teeth. The splint was constructed according to the following technic:

An impression of the upper and lower teeth was taken with an alginate impression material, and models from this were poured in stone-hard plaster. From the models the tooth or teeth to be extracted were removed and over this area a layer of dental wax was fitted. Another alginate impression was taken from the first model and a second model cast in stone. The models were set up on an articulator with the aid of a wax bite. On the second model a layer of wax was placed, trimmed to the exact requirements of the splint, and processed in clear acrylic resin.

The reason for the first layer of wax over the tooth socket was to allow sufficient space between the acrylic splint and the socket for insertion of black gutta-percha. From experience it was found that this gutta-percha was tolerated by the soft tissues in the region of the wound much better than the hard acrylic resin. At the same time a close seal was achieved. When significant bleeding occurred, the splint was removed for reapplication of local hemostatic measures; the splint was then reinserted. If insignificant bleeding occurred, the splint was left in position for from 10 to 14 days before removal, by which time the socket was generally healed. The purpose of the splint was to protect the soft friable clot in the socket from trauma by food or from disturbance by the tongue, and to hold hemostatic dressings in position. The splint was not used to exert pressure on the socket. The splint enabled the patient to take a soft pulped diet and to be ambulatory in the ward.

Local hemostatic treatment consisted of an adsorbable dressing such as gelatin sponge with bovine thrombin or Russell viper venom. The application of local hemostatic agents to the tooth sockets was of limited value.

In the 32 operations, the number of days before the sockets were well healed ranged from 9 to 23. The commonest time for hemorrhage was the third day after extraction, but in one instance this was occurring 17 days after the extractions. It was inadvisable to extract more than two teeth at a time; where possible, two adjacent teeth were removed. Replacement therapy consisted of two pints (1,140 ml.) of fresh frozen plasma immediately before extraction and on the occurrence of bleeding, provided this was severe. Oral antibiotic therapy was used for five days from the time of extraction.

■ SYNOPSIS OF PATHOLOGY. By W. A. D. Anderson, M.D. Fourth edition. 829 pages with 328 text illustrations and 12 color plates. $8.75. St. Louis, C. V. Mosby Co., 1957.

It is about five years since the third edition of this very useful volume was published. This revision adds approximately 40 pages and supplies nearly the same number of illustrations. These changes are evenly distributed and include alterations both in the text and the references cited at the end of each chapter. The book has all the advantages of the preceding editions; namely, brevity, authoritative treatment, excellent coverage and a logical arrangement; to these the revisions have contributed much.

The text is well written and easy to understand. The paper, printing and binding are of high quality. Again this volume on general pathology is strongly recommended for use where an abbreviated text may find a place.—*Edward H. Hatton.*

■ THE FIGHT FOR FLUORIDATION. By Donald R. McNeil, Ph.D. 241 pages. Index. $5. New York, Oxford University Press, 1957.

The author, the associate director of the Wisconsin State Historical Association, has read very widely indeed and has checked his information carefully with such investigators as Frederick S. McKay and H. Trendley Dean. Dr. McNeil had access to the personal papers of the late John G. Frisch of Madison, Wis., Dr. McKay's papers, the correspondence of G. V. Black at Northwestern University, the facilities of the libraries of the American Dental Association and the American Medical Association, and the records of the Washington State Health Council. His style of reporting will be found refreshing to the reader.

The ten chapters, beginning with "Why the Stain?" and ending with "The Lines Solidify," an assessment of ten years of fluoridation, document the development of a new measure in the practice of public health while the measure still is controversial and information still is fresh and available. Dentists and others interested in the promotion of fluoridation will find this book scientifically accurate, informative and intriguing.—*Kenneth A. Easlick.*

■ ORAL MEDICINE. By Lester W. Burket. Third edition. 558 pages with 351 illustrations including 40 in color. Index. $14. Philadelphia, J. B. Lippincott Co., 1957.

Since it was first published in 1946, Burket's *Oral Medicine* has been widely used as a textbook for undergraduate study in dentistry and as a reference work for practicing dentists. The newly published third edition has the same basic text, with many improvements and additions. In general, the book covers the field of oral medicine in good detail, emphasizing early diagnosis of local oral changes and those that are reflections of systemic disease. Considerable attention is also given to the evaluation of the general health of the patient, especially by comprehensive history taking.

The current edition contains a new chapter on oral cancer by Castigliano, who emphasizes the dentist's responsibility in the early recognition of malignant disease. This chapter, as well as others in the book, are generously illustrated with well-reproduced pictures, illustrating the various types and locations of oral and facial cancer. An important portion of the chapter is devoted to the management of dental disease in regions that have been exposed to irradiation and to the treatment of osteoradionecrosis.

The other features of the book are an atlas of oral lesions, with 40 colored illustrations, and a regional diagnostic index. The index has been developed to function as a diagnostic aid by allowing the clinician to limit the conditions affecting certain anatomical regions to a

given list of diseases. Each anatomic region is shown in an illustration, and the potential diseases are listed.

As in the past, *Oral Medicine* remains an outstanding textbook. Its current improvements have significantly increased its value.—*Fred A. Henny.*

■ BLAKISTON'S NEW GOULD MEDICAL DICTIONARY. Edited by Normand L. Hoerr and Arthur Osol. Second edition. 1,463 pages with 252 illustrations. $11.50. New York, McGraw-Hill Book Co., 1956.

This new medical dictionary is an outstanding contribution by an eminently qualified editorial board assisted by 88 additional contributors. Although it is based on *Gould's Medical Dictionary,* it should not be considered merely a revised edition, but it must be classified as a new work since it contains 12,000 new entries and 8,000 changes from the original edition. It incorporates advances and new terminology in all fields of medicine and dentistry, and, as a result, it is universally satisfactory for reference work.

The illustrations cover 45 pages and include anatomical drawings in color with good detail; a generous section on normal blood cells, malaria parasites and common bacteria; clinical photographs of many dermatological diseases; a section on fractures and their treatment, and diagrammatic illustrations of methods of skin suturing.

The appendix contains very complete tables on all reference facts that might be useful. They include complete descriptions in table form of all arteries, veins, bones, ligaments, muscles and nerves in a section encompassing 77 pages. There are also tables giving normal values of blood constituents, medical signs and symbols, pathogenic organisms, prescription writing, vitamins and weights and measures, in addition to much other valuable reference information.

Dental terminology is covered thoroughly and in very acceptable form, as are terms in other fields of basic interest. The dictionary can be recommended with enthusiasm, for its completeness makes it an outstanding one volume reference work that will be a welcome addition to any professional library.—*Fred A. Henny.*

■ THE AMERICAN FLUORIDATION EXPERIMENT. By F. B. Exner, M.D., and G. L. Waldbott, M.D. Edited by James Rorty. 277 pages with 7 tables. Index. Appendix. $3.75. New York, Devin-Adair Co., 1957.

This book presents a compilation of all the scientific data and personal opinions which may be used as material to oppose fluoridation of public water supplies.

Part 1, written by F. B. Exner, is introduced by a biographical sketch of the author and discusses the physiological action of fluorides, in his opinion why fluoridation is dangerous, chronic fluorosis in man and animals and the political aspects of fluoridation.

Part 2 follows a biographical sketch of its author, G. L. Waldbott, and is concerned with the allegedly observed fluoride poisoning in the cities whose water has been fluoridated. Fluoridation promotion methods are also discussed.

Part 3, entitled "The Fluoridation Resistance Movement," was written by the editor of the book, James Rorty, whose biography may be found on the inside back cover of the dust jacket. This section discusses engineering problems of fluoridation and alternatives to fluoridation and includes an interesting chapter entitled "The Revolt of the Human Test Animals."

The arguments opposing fluoridation presented in this book seem to be based on hearsay, partial quotations and supposition, and in the mind of this reviewer they do not counteract the mass of scientific evidence which supports fluoridation. The one possible exception is the evaluation by K. K. Paluev of the statistical data presented in the Newburgh, N. Y., study. In any epidemiological statistic, the "average reduction" in dental decay among a group of children fails to present a complete picture—the reduction should always be shown for each year of age.—*William F. Via, Jr.*

■ LEHRBUCH DER CHIRURGIE (TEXTBOOK OF SURGERY). Edited by H. Hellner, R. Nissen and K. Vosschulte. 1,059 pages with 596 illustrations. Index. DM. 84. Stuttgart, Georg Thieme, 1957.

This monumental and up-to-the-minute work is not so much a description of surgical procedures and operative technics as it is a well-rounded presentation of the underlying principles on which the practice of surgery is based. Pathophysiology and clinical and surgical aspects of diseases are stressed, whereas questions of operative technic are covered briefly. Although the text is supported by well-chosen diagrams, photographs and roentgenograms, the editors have kept the number as small as possible. It is their teaching philosophy that visual representations should not predominate lest they serve to promote intellectual laziness, a danger to which they feel the practicing physician is exposed to a considerable degree. Only a relatively few of the illustrations are borrowed from other sources; the majority appear for the first time in this book.

A textbook which so thoroughly and authoritatively covers all fields of surgery could not have been written by one person or even a few co-authors. In this book, the editors have combined their own contributions with those of 30 co-workers, mostly professors and directors of university clinics in many chief cities in Germany and Switzerland. In such a great joint effort it is not surprising that various interpretations and theories of disease processes are presented. The editors do not object to this for the student and the physician are thereby stimulated to take a personal point of view and to make a critical comparison—"a condition, which appears to us particularly important."

Of the 23 chapters which comprise the book, the first 12 are on more general and basic aspects of the subject, including the development of surgery, wound healing, hemorrhage and transfusion, infections, tumors in general, use of radioisotopes, shock, thrombosis and embolism, anesthesia, plastic surgery and transplantation, surgical technic and pathophysiology related to surgical treatment.

The remaining chapters consider surgery of particular systems, such as of the nervous, circulatory and urogenital systems, and of the extremities, head and face and neck. These chapters in turn, mostly are subdivided into logical sections, each of which may be written by a different specialist. The chapter on the abdomen, for example, has ten subdivisions prepared by eight of the contributing authorities. The subject of each subdivision, then, is usually considered under such headings as history, anatomy, physiology, pathophysiology, congenital anomalies and diagnosis and therapy, and the disorders of the system or particular organ are considered also.

Some notion of the completeness of the coverage may be gained by noting that the table of contents in outline form covers 36 pages. Each chapter and subdivision is well-documented by references to the literature, both classic and recent (1956). The typography, paper, illustrations and binding are typical of the high standards of publishing maintained by Georg Thieme. Considering the large number of contributors, the text is surprisingly uniform in its readability and conciseness.

The comprehensive coverage, fine illustrations and emphasis on fundamentals of anatomy, physiology and pathology should make this book a valuable addition to any surgeon's library, regardless of his specialty, and well worth any additional effort that the text's being in German may require of him.—*Vernon E. Krahl.*

Announcements

■ Oral Surgeons Plan Three-Day Scientific Program

The annual meeting of the American Society of Oral Surgeons will be held from October 30 to November 1 at the Golden Gate Hotel, Miami Beach, Fla. Attendance is limited to members of the Society and invited guests.

Featured on the scientific program will be teaching courses conducted by a faculty composed of members of the Society and outstanding nonmembers from both the dental and medical professions. There also will be a general essay program featuring the latest advances in the field of oral surgery and other allied sciences.

The main social event of the meeting will be a banquet on Saturday evening, November 2, at the Golden Gate Hotel.

■ Annual Session Features All Day Essay Program on Oral Surgery

Outstanding essayists in the oral surgery field will make individual presentations on Wednesday, November 6, as part of the scientific session of the American Dental Association's 98th annual meeting in Miami Beach, Fla.

Karl H. Wood will preside over this all day program which will include presentations by Joseph P. Cappuccio, Baltimore; Stanley L. Lane, New York; Allyn S. Abramson, Los Angeles; Isaih Lew, New York and Edwin Hinkson and S. James Krygier, Wilmington, Del. Common bone lesions, plastic procedures as applied to oral surgery, extractions, implant dentures, and exposure and repositioning of malposed, unerupted and impacted teeth will be the topics discussed.

This four-day session of the Association, which begins on November 4, also will include color T-V clinics, one and two-day forums, 14 half-day panel discussions, projected clinics, table clinics and motion picture and slide clinics. All scientific programs will be held at the Dinner Key Auditorium, Miami.

■ Minnesota to Offer Advanced Oral Pathology in Spring

The dental and medical faculty of the School of Dentistry, University of Minnesota, will present a course in advanced oral pathology during the week of April 28 through May 2, 1958.

Material presented will include neoplastic and nonneoplastic diseases of the salivary glands, neoplasms of dental origin, bone pathology, soft tissue neoplasms, dermatologic pathology, diseases of the lymphoid system and oral roentgenographic evidence of systemic diseases.

Tuition will be $50 for the week. Interested individuals may contact Robert J. Gorlin, chairman, division of oral pathology, at the school in Minneapolis.

■ Ochsner Clinic Opens Oral Surgery Department

The Ochsner Clinic, New Orleans, has announced the opening of an oral surgery department. James H. Quinn heads this new department.

■ Ohio State Announces 1957-58 Postgraduate Courses

Three courses of particular interest to oral surgeons are included in the postgraduate schedule for the coming year at the College of Dentistry of Ohio State University. Each is offered for five consecutive days, Monday through Friday, and each is limited to approximately 10 per class.

The courses and the dates they are to be offered include: oral surgery, October 14-18; general anesthesia, October 21-25 and April 28-May 2 and oral pathology, March 10-14.

Further information and application forms are available from the postgraduate division of the college at Columbus 10, Ohio.

■ Oral Surgeons to Hold Special One-Day Workshop in Miami

On October 30, the American Society of Oral Surgeons will discuss two major problems at a one-day workshop to be conducted at the Golden Gate Hotel. Members will explore the proposed reorganization of the Society and the regulations governing the practice of oral surgery in hospitals.

The morning session will be devoted to the presentation of formal papers by authorities representing the American Hospital Association, the Joint Commission on the Accreditation of Hospitals, the American Dental Association and the American Society of Oral Surgeons.

During the afternoon, the meeting will be divided into a number of work groups, each of which will discuss one or more phases of the formal morning program.

■ Metropolitan-New York Society to Meet in October

The Naval Hospital at St. Albans, Long Island, will be the site of a clinical and business meeting of the Metropolitan-New York Society of Oral Surgeons on October 6.

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